

Living close to forests enhances people's perception of ecosystem services in a forest-agricultural landscape of West Java, Indonesia



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Source: <http://cifaljeju.org/>



Source: <http://asia-parks.org/>

Our study also
focused on
“**conservation**”
& “**connection**”

➤ CBD-COP 10 (**Aichi Target** by 2020):

-
- Conserve at least 17% of terrestrial and 10% of coastal and marine areas through protected zones;
- Restore at least 15% of degraded ecosystems;
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➤ Theme of 1st Asia Park Congress:

“**Connection**”:

- between people and nature;
- between cultural, spiritual, and natural values;
- between park and wider landscape/seascape

(...*satoyama* landscape and other *satoyama*-like)

➤ Perceptions of **local people** about particular **landscape elements** as sources of **ecosystem services** not only within, but also **outside of protected areas**:

- within a forest to agricultural landscape (*satoyama*-like)
- established sustainable landscape management that fulfill conservation objectives & reduce poverty

- Urgent to maintain ecosystem services & fulfill food production:
 - Local people dependent on surrounding landscape (*Fagerholm et al. 2012*)
 - The landscape provide **bundle of ecosystem services (ESs)** for **free**: (from natural resources to cultural/spiritual value) (*Dolisca et al. 2007*)
 - Forest conversion & intensification threaten the provision of ecosystem services (*Jackson et al. 2007*)

- Lack of landscape approach:
 - Various landscape elements provide bundle of services
 - Understand roles of **human-modified landscapes: within & beyond protected areas** (*Chazdon et al., 2009*)
 - Local people as key stakeholder (use, manage, & modify landscape) had to be included (*Campos et al. 2012*)

- Growing demand to incorporate social dimension:
 - Mostly biophysical quantification or economic valuation
 - Need to understand how people **benefits** from ecosystem & **perceive ESs** (*Anton et al., 2010*)
 - Crucial to identify which ESs & landscape elements are more preferable (*Martín-López et al., 2012*)

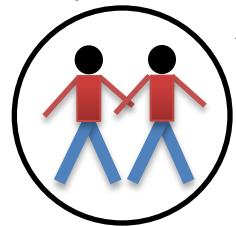
- Assessed perceptions of local people about ESs:
 - Identify **ESs** & associated **landscape elements** are used & perceived
 - Quantify **socioeconomic** factors **affect** perception of ESs
 - Assess **differences** in **landscape elements** as **sources** of ESs
- A case of forest–agricultural landscape in West Java:
 - Opportunity to add forest **protection areas** had been **exhausted**
 - Protected areas are **surrounded** by high **human** population
 - **Poor** people **dependent** on various landscape elements for ESs



Goals

- Help to implement **participatory forest conservation**
- Establish sustainable rural **landscape management**
- Alternative **source of preferable ESs**
- Fulfill **conservation objectives** & reducing **poverty**

Use & Perceive ESs



Local people

Collection, extraction

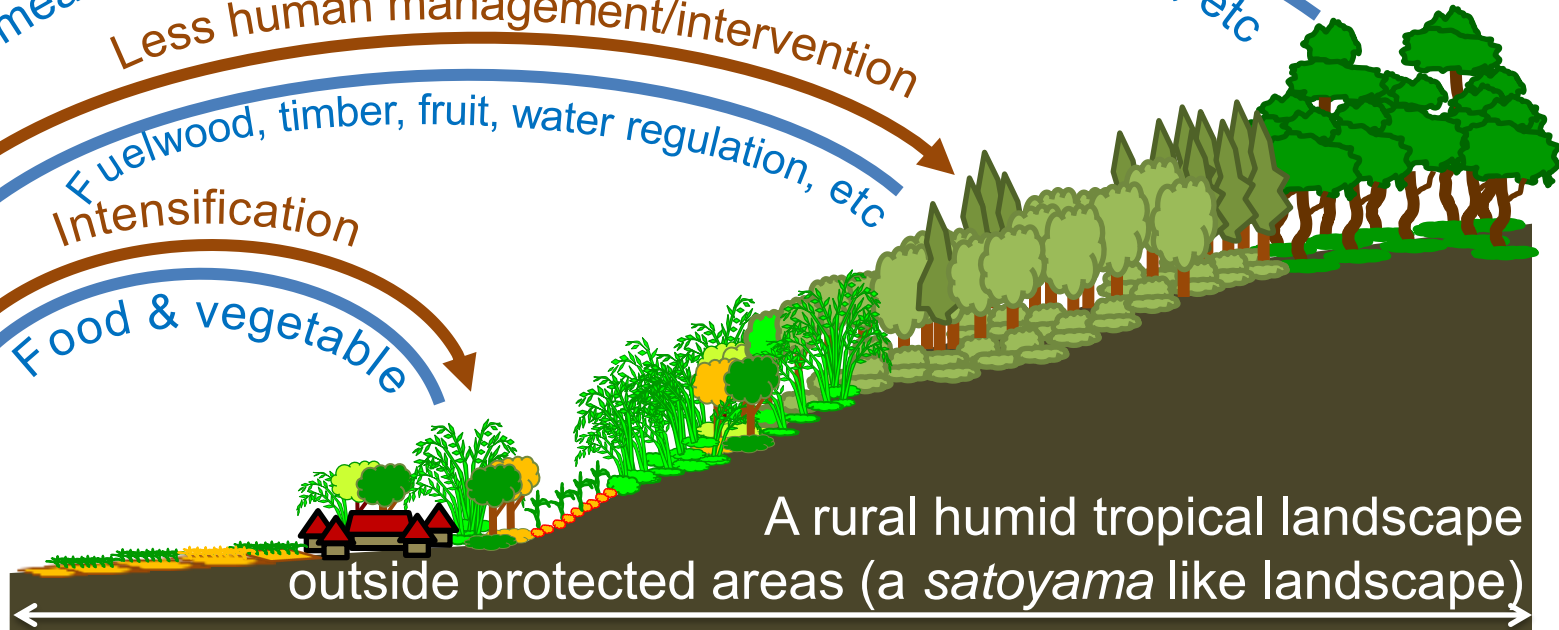
Bush-meat, wild animal as pets, water regulation, sacred places, etc

Less human management/intervention

Fuelwood, timber, fruit, water regulation, etc

Intensification

Food & vegetable



A rural humid tropical landscape outside protected areas (a *satoyama* like landscape)

Intensified

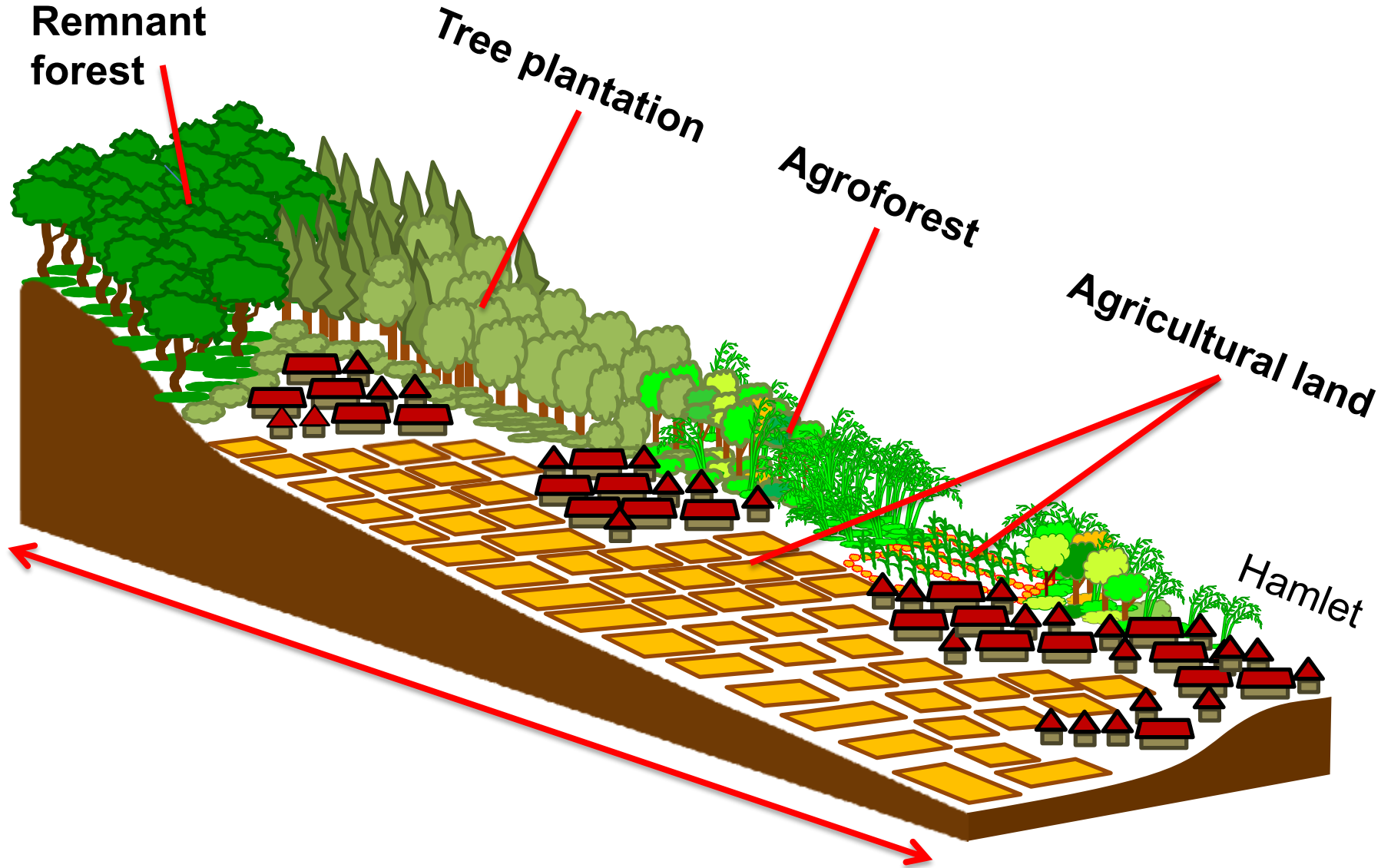
Semi-natural

Natural

Study site

6





Schematic of a gradient of forest–agricultural landscape in study site:
mosaic of natural and human-modified elements

Data collection:

- Preliminary survey to key informants
 - Information collected:
 - Identify ESs that actually beneficial & appreciated
 - Identify landscape element as the source of ESs



- Structured interview techniques, information collected:
 - **Respondent profile:**
 - **Individual perception about type of ESs**
 - **Individual perception about landscape element as source of ESs**
- Sampled **138** households (**47%**) engaged to agriculture
- Samples distributed in **18 hamlets**

Data analysis 1:

General pattern of people perception

Table 1. Summary for each respondent

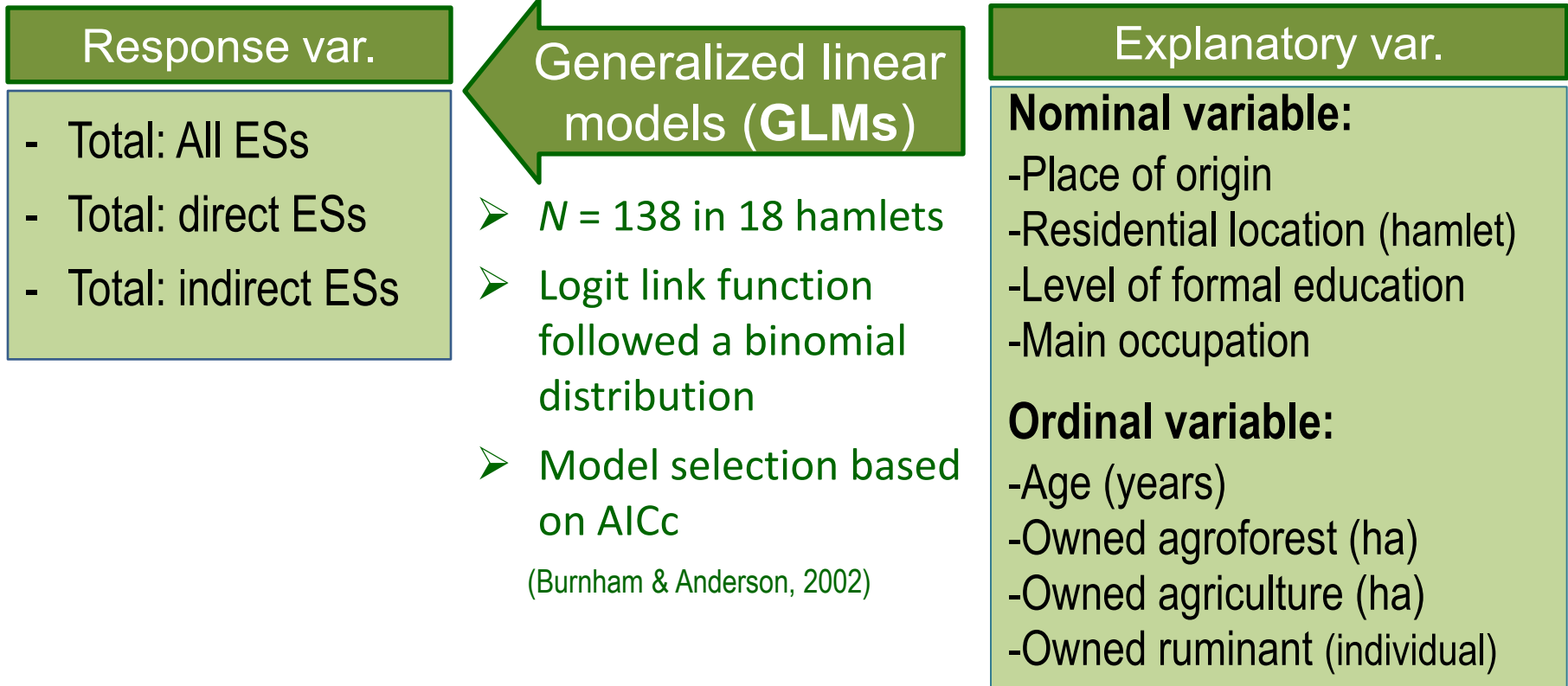
ESs	Resp. 1	Resp.1 Source	...	Resp.138	Resp.138 Source
ES 1	Yes	F, TP	...	Yes	F
.....
ES 23	Yes	F, TP, AF	...	No	--
Total: direct	10		...	9	
Total: indirect	10		...	3	For GLMs
Total: all	20		...	12	

Table 2. Summary for each ES

Ecosystem services	Number of respondent (answering 'yes')				
	Total	Landscape element (multiple answer)			
		Remnant forest	Tree plantation	Agroforest	Agriculture
ES 1	57	17	43	-	-
.....
ES 23	53	28	3	43	-
Cumulative number	138	90	75	125	45

Data analysis 2: GLMs (Generalized Linear Models)

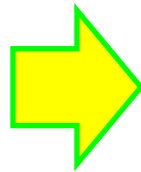
Socioeconomic factors affecting the degree of individual perception



Data analysis 3:

Proportion differences of perceived sources

Accessibility to remnant forest



Which landscape elements are perceived as source of each ES

- Respondents classified into 2 groups

Based on proximity of their hamlet to the remnant forest:

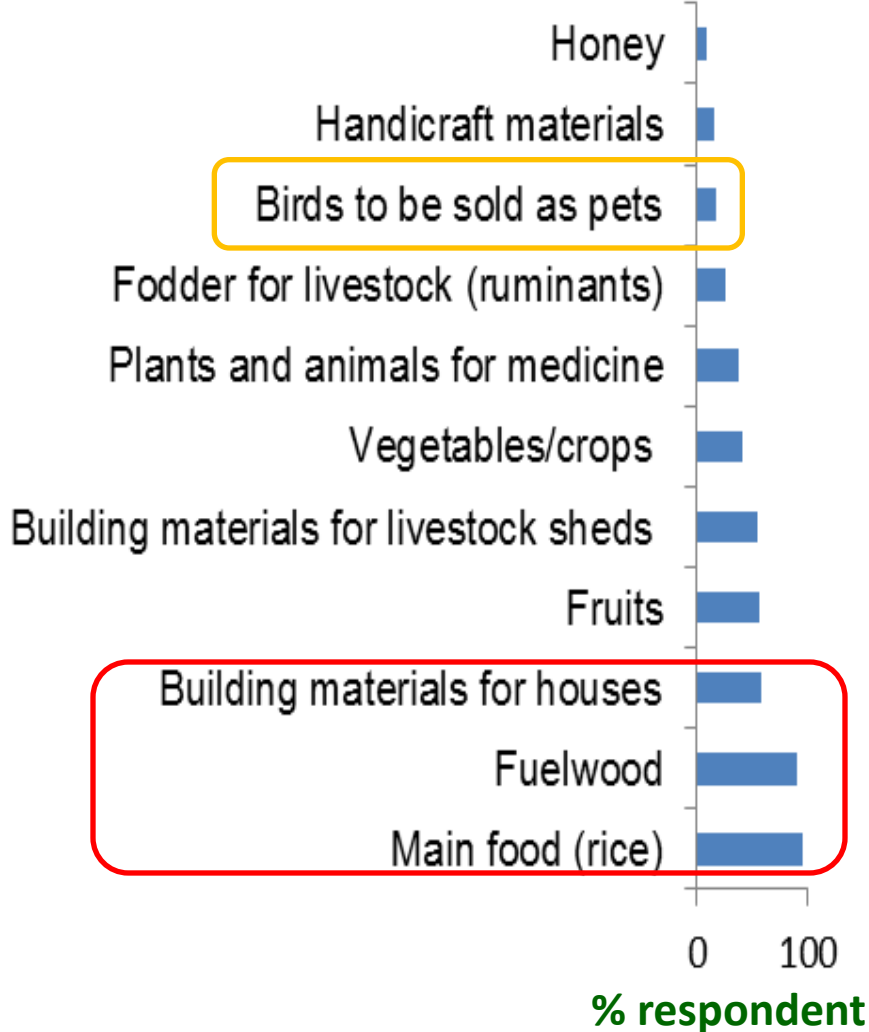
*(Threshold **1.5 km** that divide the number of respondents evenly)*

- “**Close**” groups (< 1.5 km): 71 respondents
- “**Far**” groups (> 1.5 km): 67 respondents

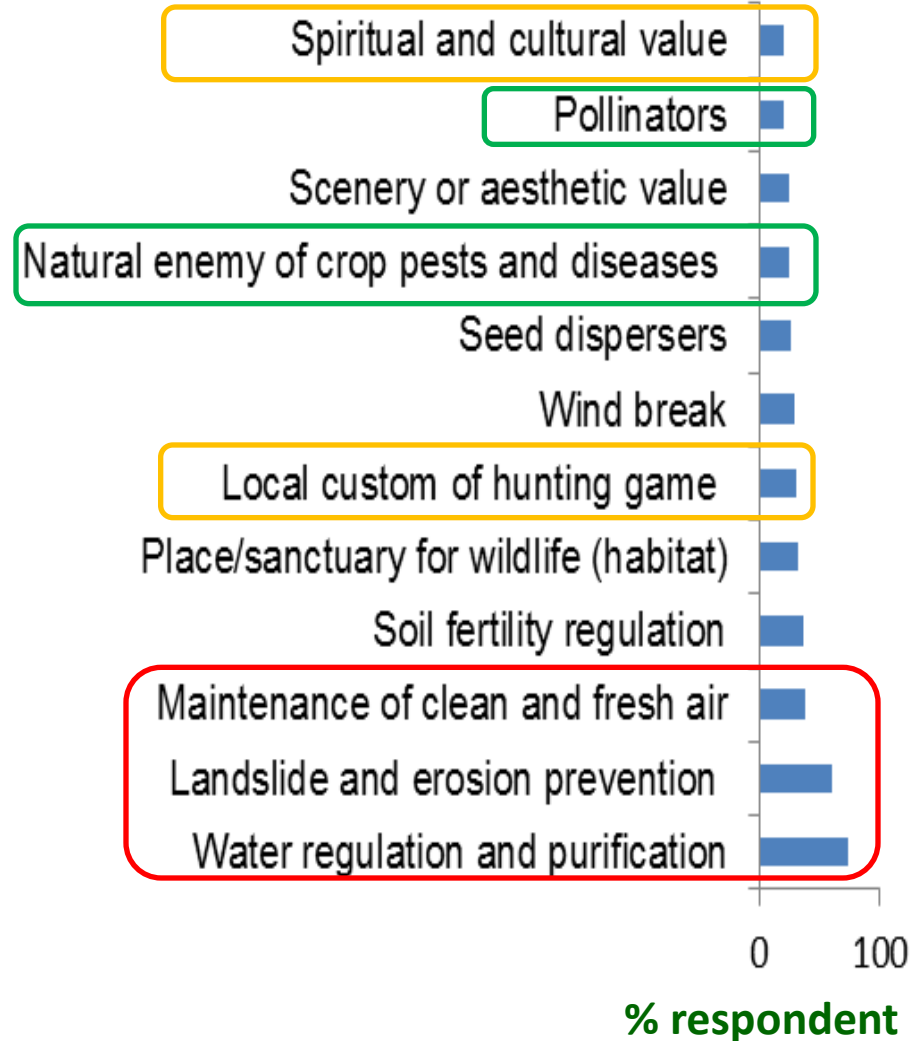
- Fisher’s exact test

- Compare proportional differences of perceived landscape elements for each ES between 2 groups

Direct services:

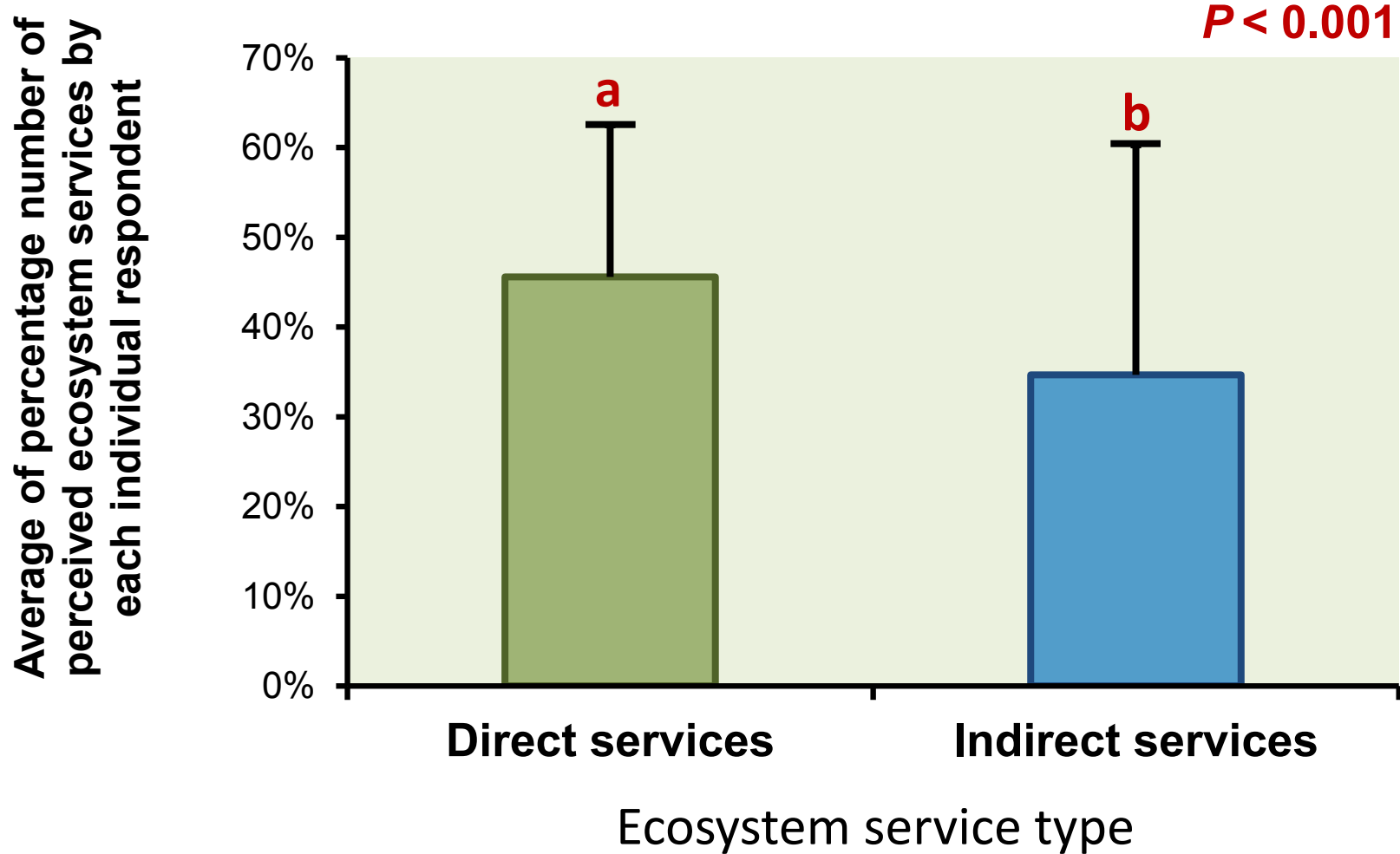


Indirect services:



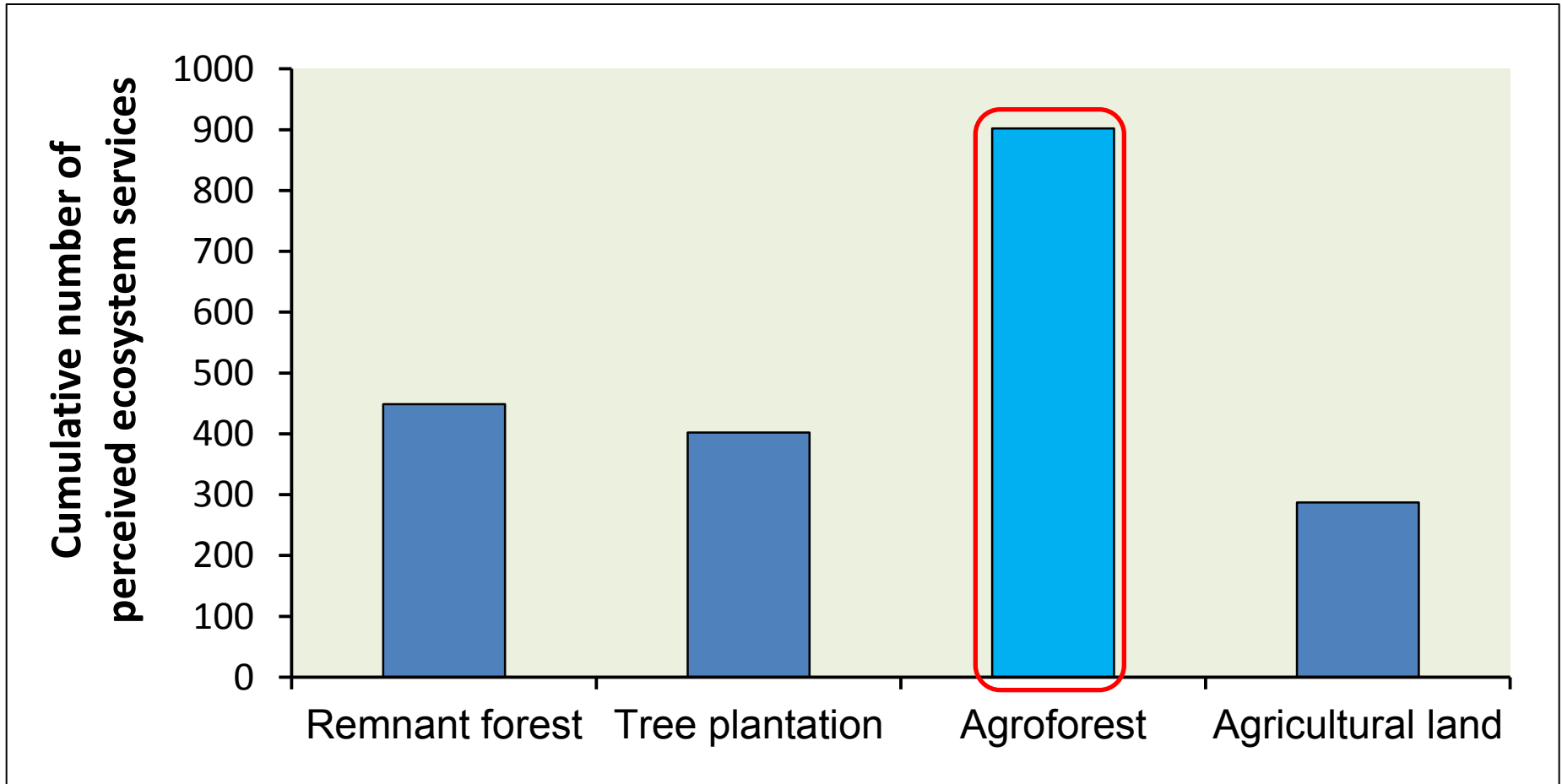
High variation in degree of appreciation among ESs

Degree of individual appreciation different between direct & indirect services



Individual perception on **direct** services > indirect services

Degree of individual appreciation varied among landscape element types



Agroforest > remnant forest as source of multiple services

Result of GLMs

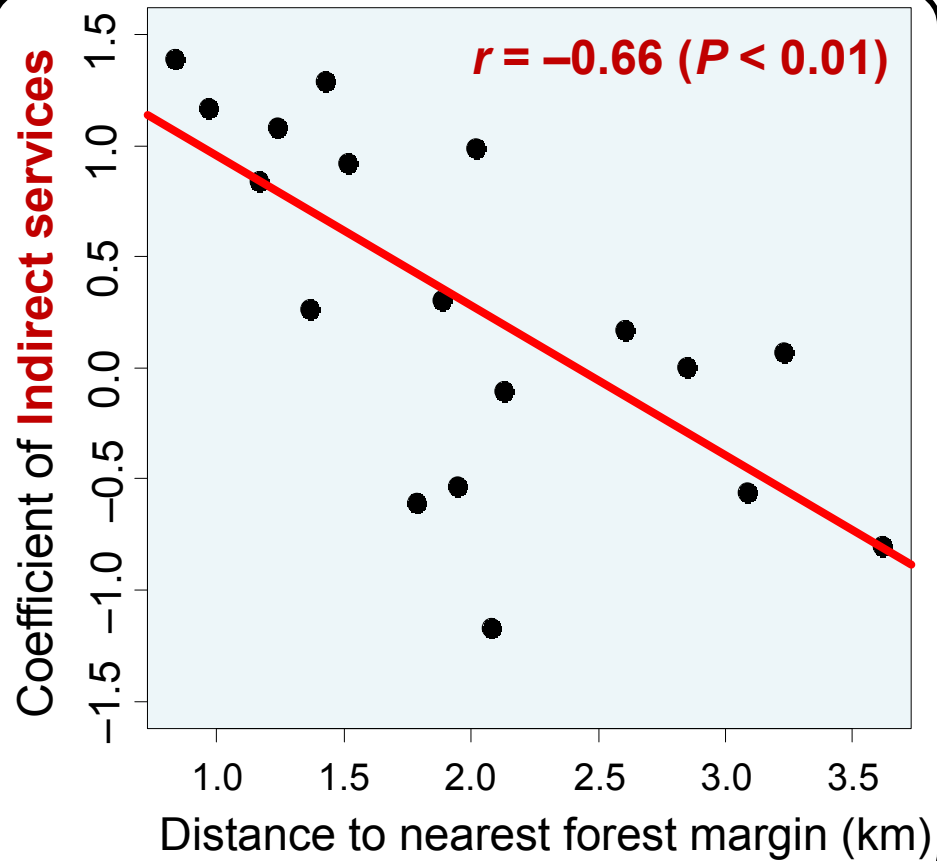
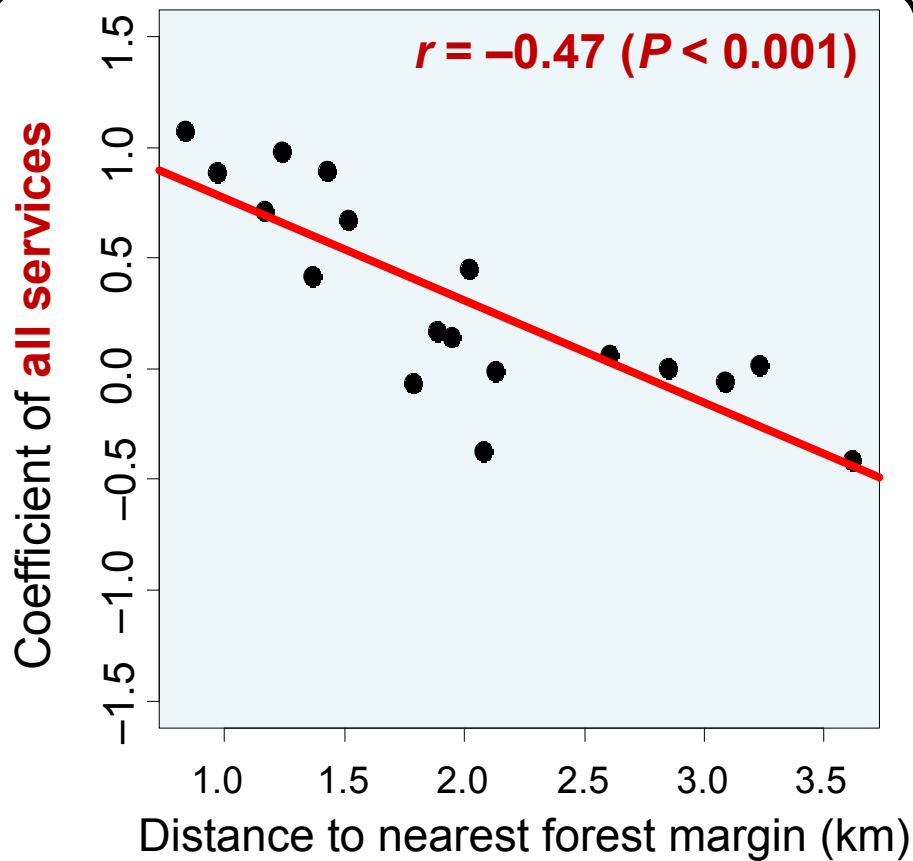
Socioeconomic factors on degree of individual perception on ESs

➤ Best model with the lowest AICc:

Response variable	Coefficients of determinant factors						
	Age	Original villagers	Hamlet	Education	Number of Livestock	Area of agric. land	Area of agroforest
All ESs	—	0.641	√	—	0.172	0.298	—
Direct ESs	—	0.606	—	—	0.217	—	0.259
Indirect ESs	—	0.804	√	—	0.134	0.371	—

People **originated** from present hamlet with **higher socioeconomic** status perceived higher number of ESs; especially indirect ESs

Effect of hamlet can be interpreted as distance to forest 16

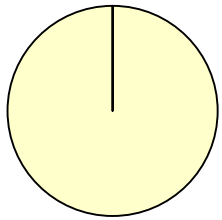


- People living **close** to forest perceived **ecosystem services** > who live **far** to forest;
- Effect is appear **stronger** in **indirect** services

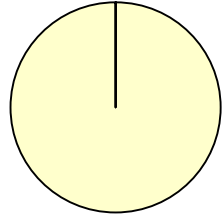
Influence of accessibility to forest to perceived source of ESs ¹⁷

Direct Services:

✓ Main food (rice)

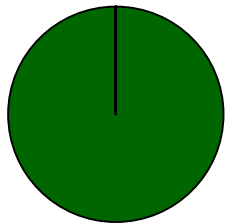


(Close: $n = 66$)

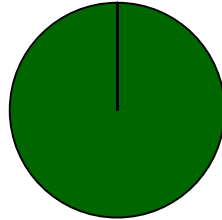


(Far: $n = 65$)

✓ Bird to be sold as pets



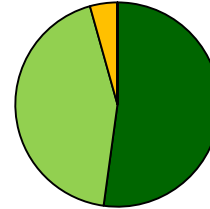
(Close: $n = 20$)



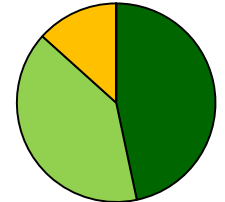
(Far: $n = 3$)

Indirect Services:

✓ Local custom of hunting game

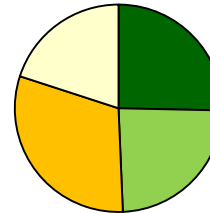


(Close: $n = 66$)

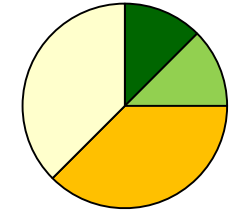


(Far: $n = 65$)

✓ Pollinators



(Close: $n = 75$)



(Far: $n = 8$)

■ Remnant forest ■ Tree plantation ■ Agroforest ■ Agricultural land

For some ESs there was **no sig. difference** between close & far groups

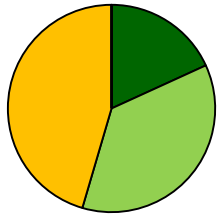
Influence of accessibility to forest to perceived source of ESs

Direct Services:

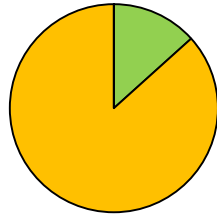
Indirect Services:

✓ Building materials for houses ($P < 0.001$)

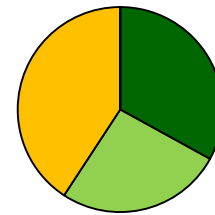
✓ Water regulation ($P < 0.01$)



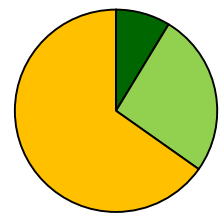
(Close: $n = 121$)



(Far: $n = 30$)



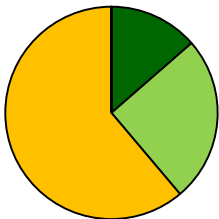
(Close: $n = 66$)



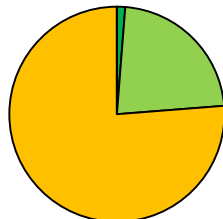
(Far: $n = 65$)

✓ Fuelwood ($P < 0.05$)

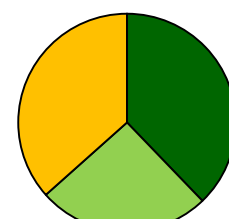
✓ Landslide prevention ($P < 0.001$)



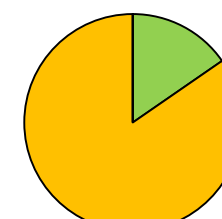
(Close: $n = 103$)



(Far: $n = 80$)



(Close: $n = 82$)



(Far: $n = 39$)

Remnant forest
 Tree plantation
 Agroforest
 Agricultural land

For some ESs there were **sig. differences** between close & far groups

Results that concomitant with previous study:

- People **highly** perceived direct & indirect ESs (*Martín-López et al. 2012*)
- Direct ESs > indirect ESs (*Fagerholm et al. 2012; Hartter 2010*)
 - Food & fuelwood are **fundamental for local people** (*Fagerholm et al. 2012*)

Highlighted findings:

- **Cultural** services perceived by people that live **close & far** from forest
 - Source of cultural services provided by **remnant forest** & tree plantations
 - People valued **biological regulation services**, but the number is **low**
- **Agroforest** as complementary source of many ESs
 - **Key landscape element** that harmonize food, conservation & poor people (*Islam 2012; Jose 2009; Nath et al 2005*)
- Existence of **destructive** activity
 - **Bird** collection to be **sold** as pet still exists
 - Instigated by **direct economic benefit**

Landscape element types	Provisioning services		Cultural services	Regulating services	
	Live close to forest	Live far to forest		Live close to forest	Live far to forest
Remnant forest	√		√	√	
Tree plantation	√	√	√	√	√
Agroforest		√		√	√
Agricultural land	√	√			

- Forest is the **main source**:
 - ✓ To continuously gain appreciation & perception about ESs
 - **Closeness** to forest:
 - ✓ Enhance people appreciation & perception about ESs
- **Potential role** of Agroforests:
 - ✓ As alternative source to increase appreciation & perception about ESs
- Maintaining landscapes composed of **various element** types is important to ensure a bundle of ESs & receive more benefit

Recommendation:

- **Protection** of remnant **forests** should be **prioritized**:
 - doesn't mean disentanglement of people from forest (maintain accessibility)
 - avoiding extractive/destructive activities
 - allowing people to live close to forest, it will increase people sensitivity
 - providing non-formal education about sustainable use of resources
 - devising ways of earning income not from forest, (e.g. from agroforest)
- **Enhancement** of **Agroforestry** (planting more trees-fruiting, timber, & native)
- Maintain vegetation structure of **tree plantation** + REDD + ecotourism



**Thank you very much
for your attention**

