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




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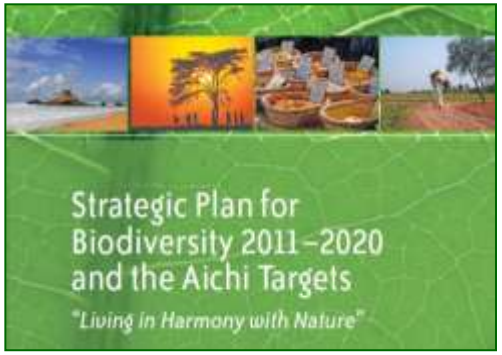
Background



Source: http://cifaljeju.org/

- 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;
  - ……

1ST ASIA PARKS CONGRESS
JAPAN 2013 | PARKS CONNECT

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

- 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)

Our study also focused on "**conservation**" & "**connection**"

- 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

Problem identification

- 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*)

Objectives

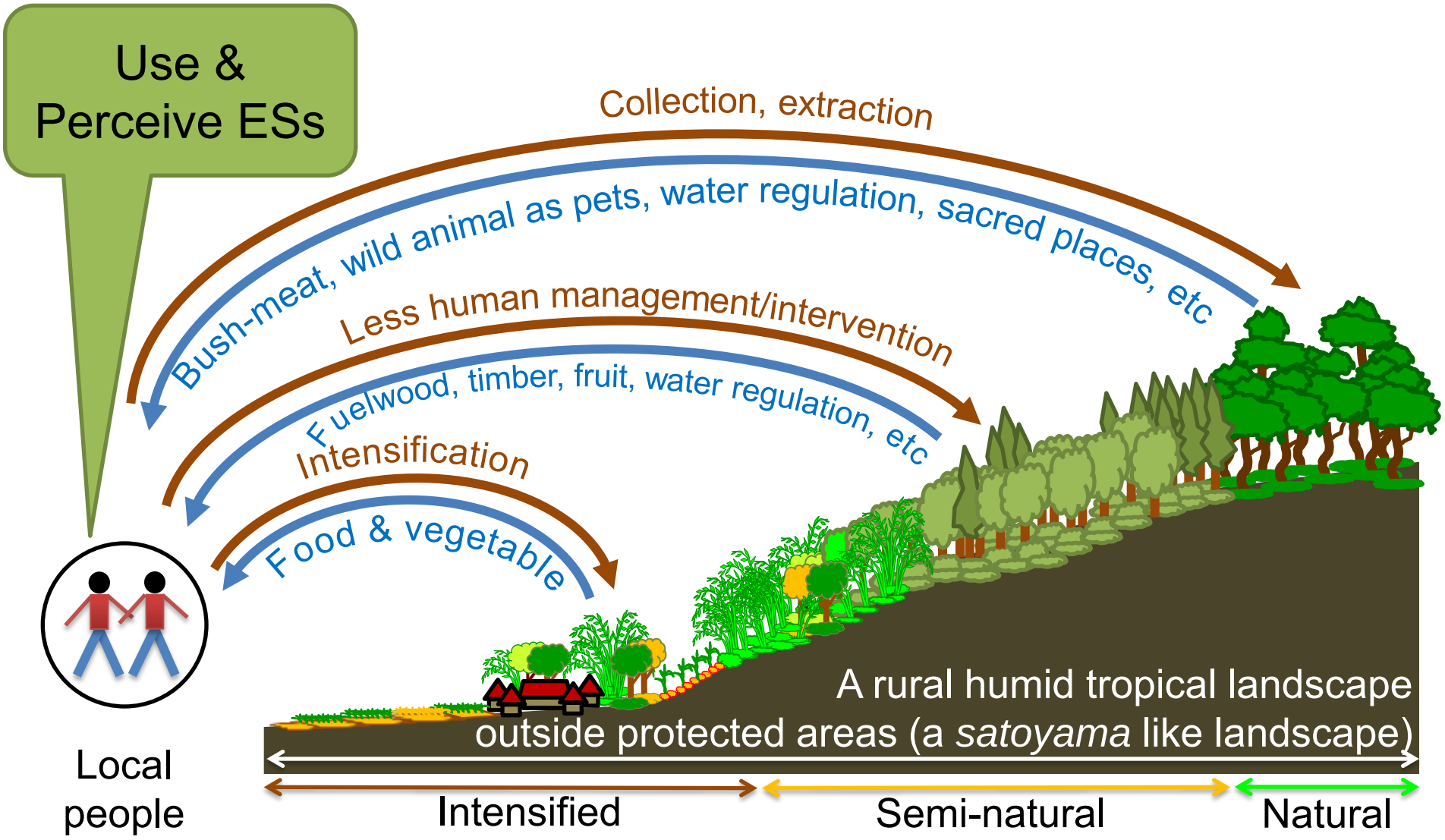
- Assessed perceptions of local people about ESs:
  - Identify **ESs** & associated **landscape elements** are used & perceived
  - Quantify **socioeconomic** factors **affect** perception of ESs
  - Assess **differences** in **landscape elements** as **sources** of ESs

- 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

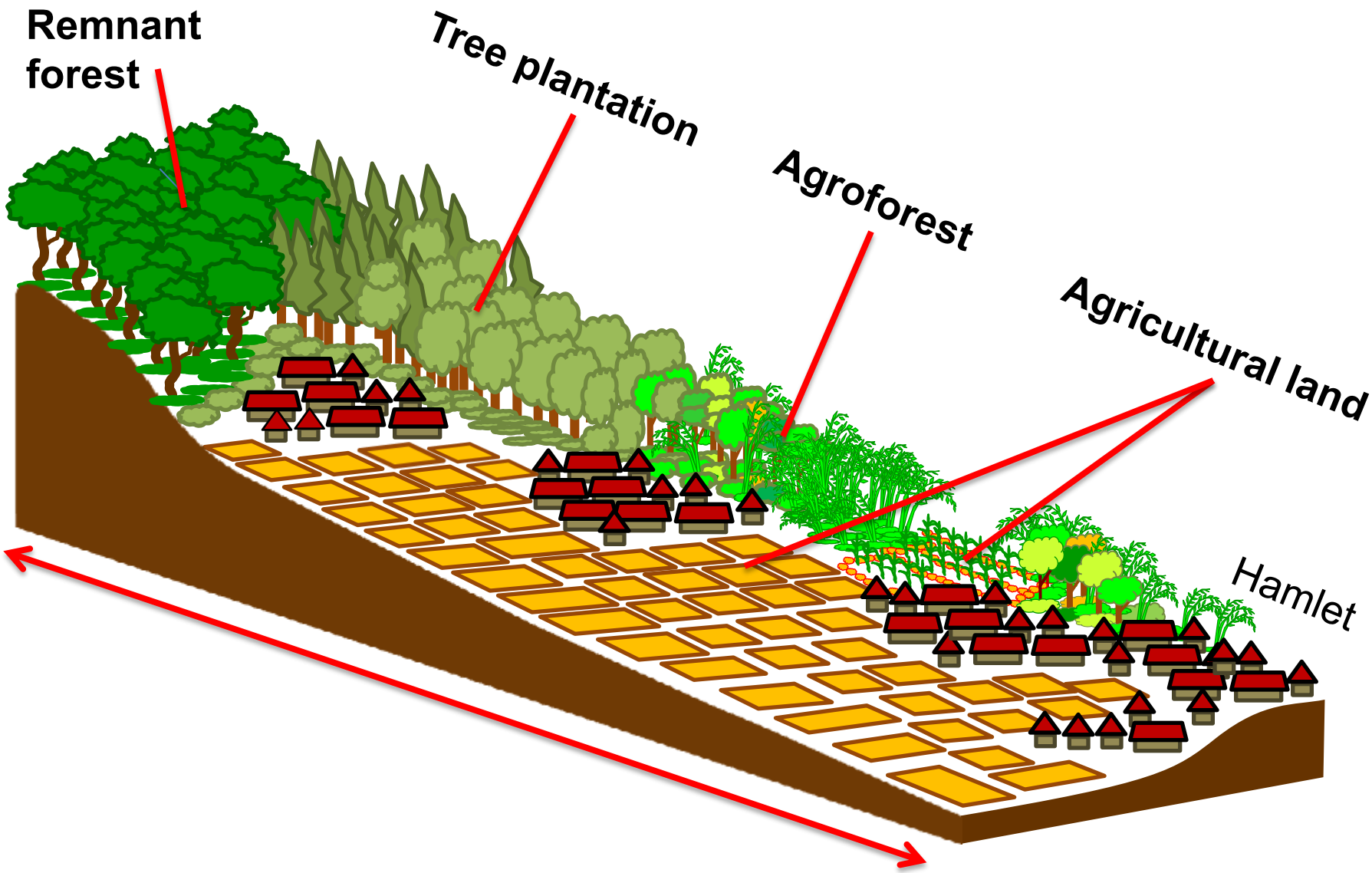
Goals

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

Frame of study



Study site



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

Methods

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

Response var.

- Total: All ESs
- Total: direct ESs
- Total: indirect ESs

Generalized linear models (GLMs)

- *N* = 138 in 18 hamlets
- Logit link function followed a binomial distribution
- Model selection based on AICc

(Burnham & Anderson, 2002)

Explanatory var.

Nominal variable:
-Place of origin
-Residential location (hamlet)
-Level of formal education
-Main occupation

Ordinal variable:
-Age (years)
-Owned agroforest (ha)
-Owned agriculture (ha)
-Owned ruminant (individual)

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:

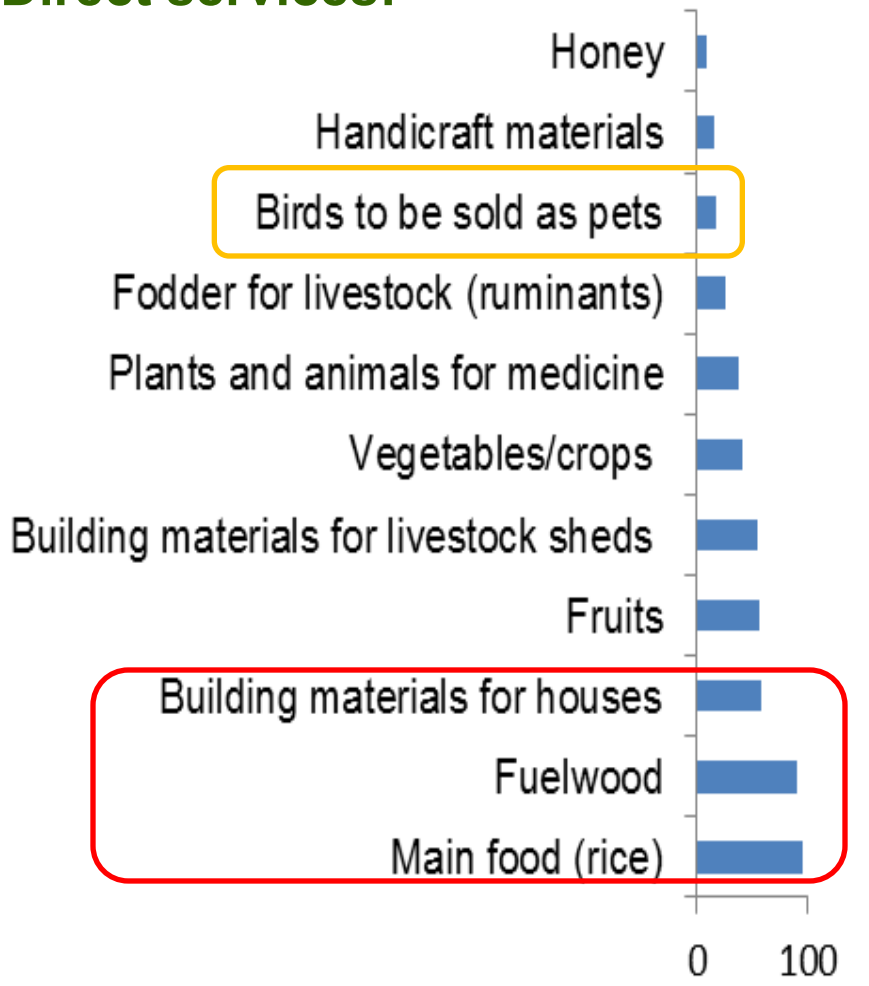
*(Threshold **1.5 km** that divide the number of respondents evenly)*

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

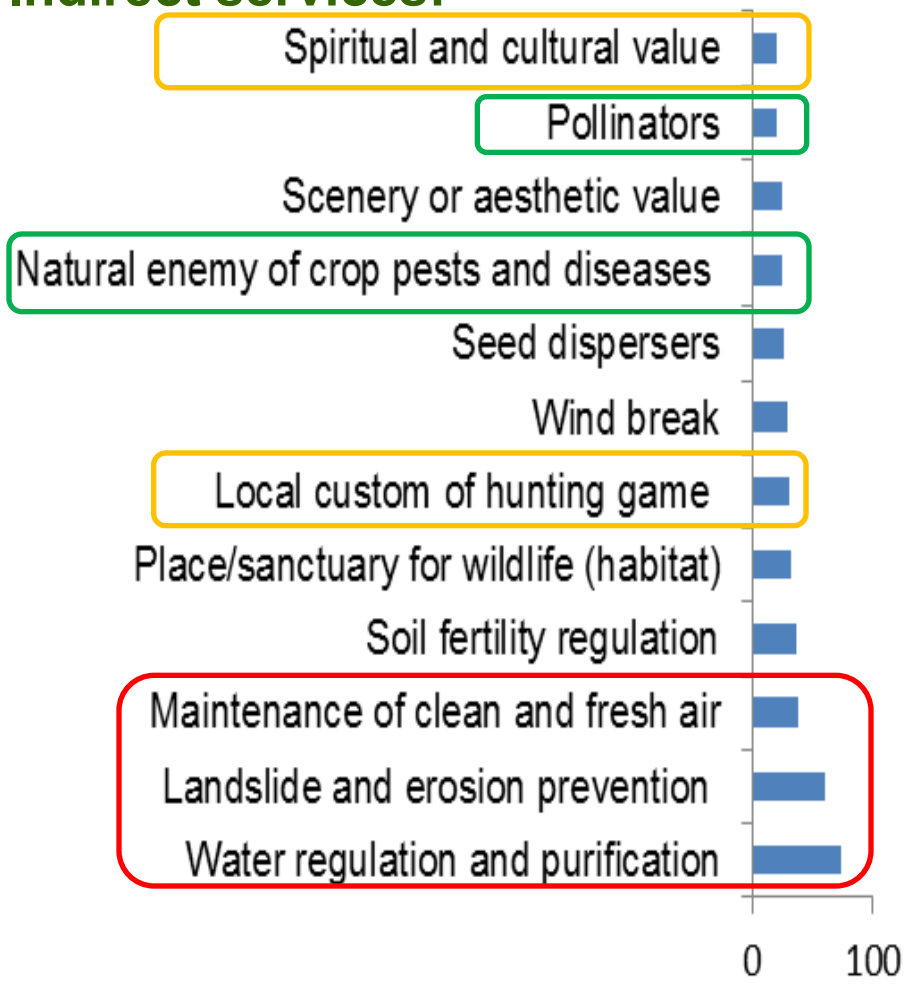
- Fisher's exact test
- Compare proportional differences of perceived landscape elements for each ES between 2 groups

Results

Direct services:

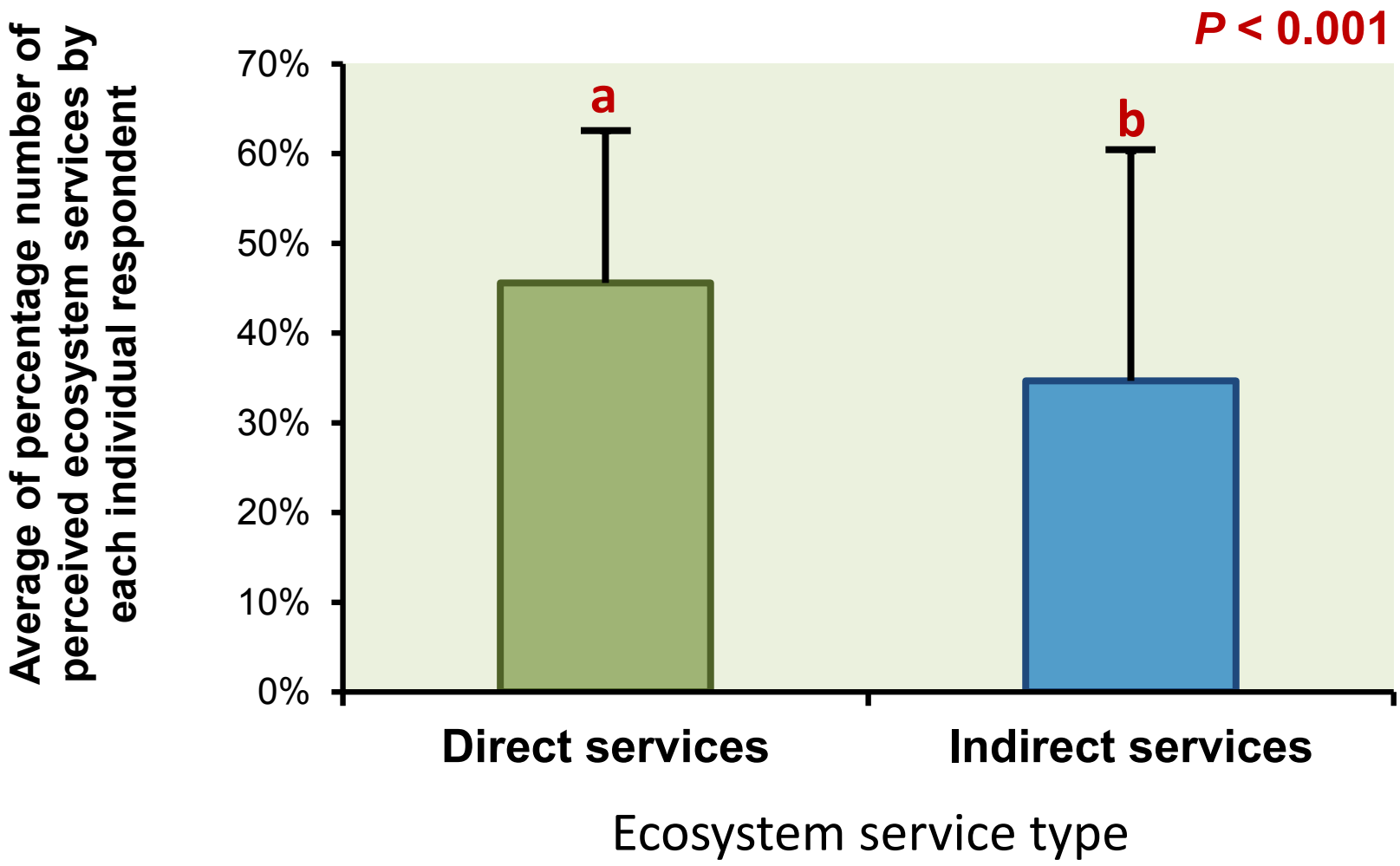


Indirect services:



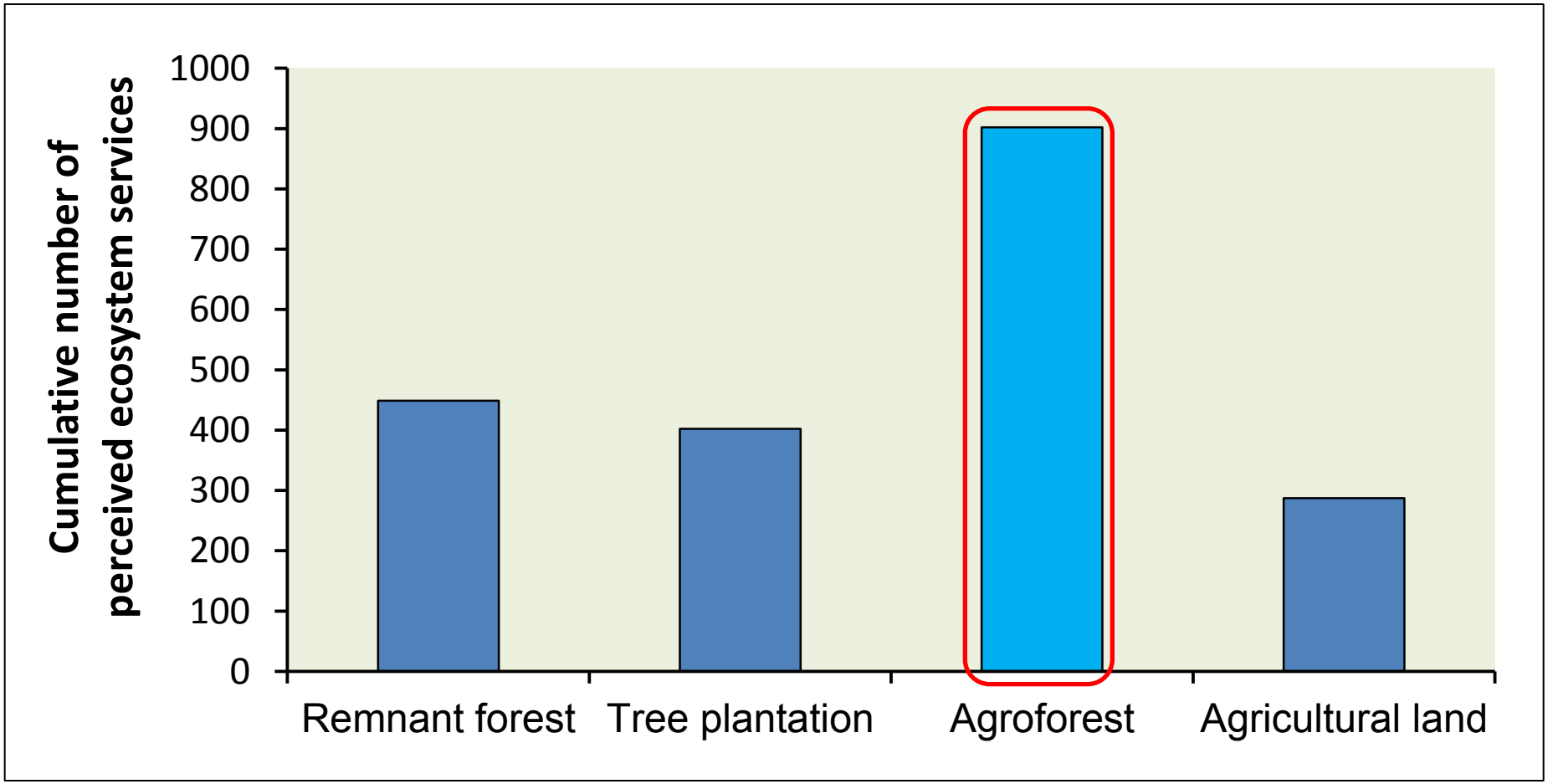
High variation in degree of appreciation among ESs

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

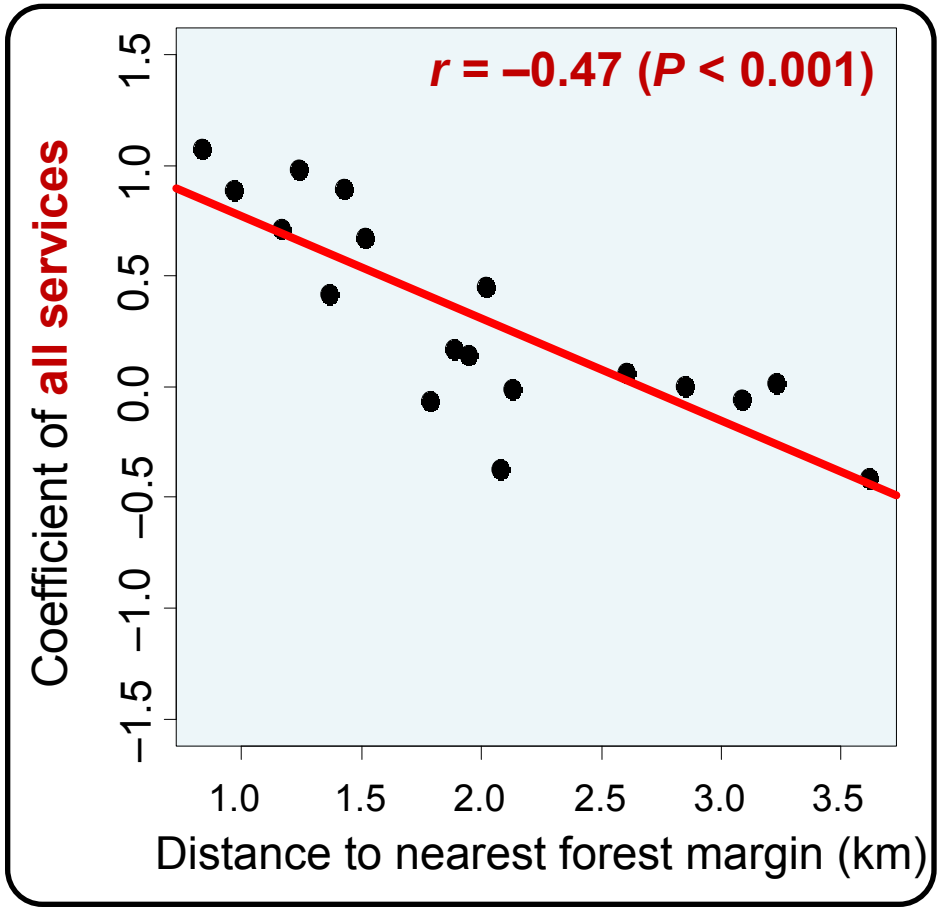
Socioeconomic factors on degree of individual perception on ESs

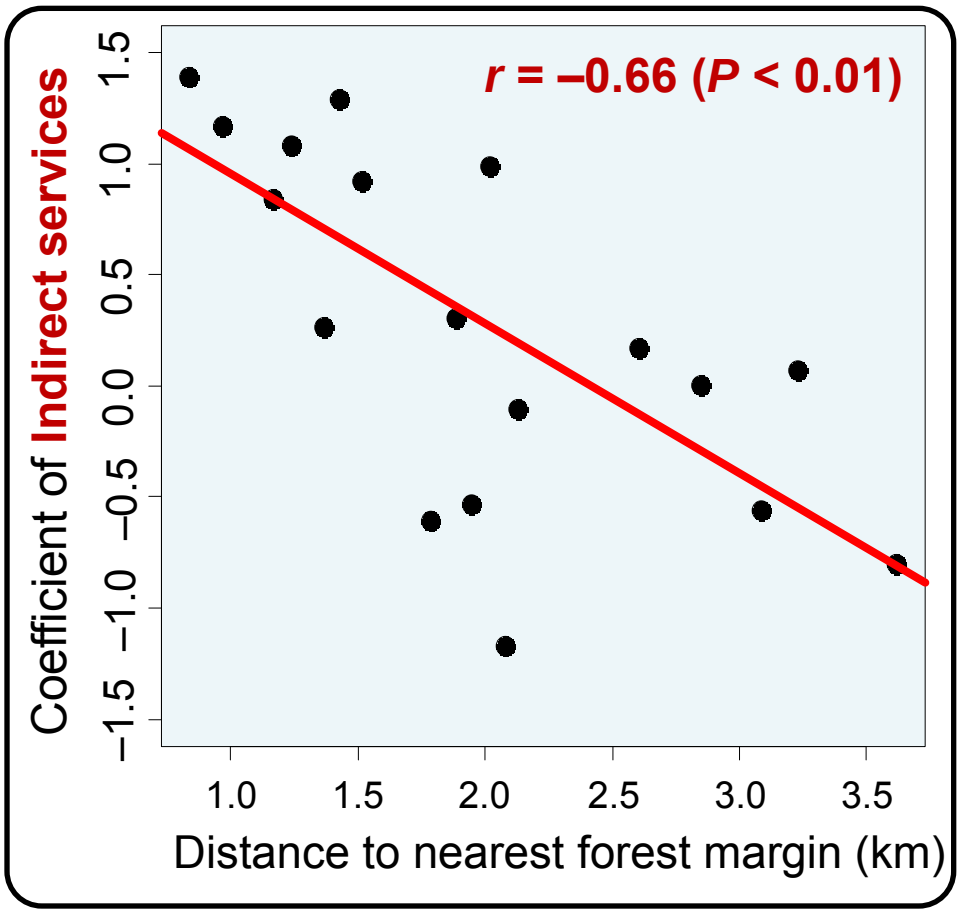
- Best model with the lowest AICc:

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



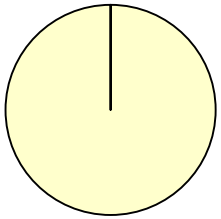


- People living **close** to forest perceived **ecosystem services** > who live **far** to forest;
- Effect is appear **stronger** in **indirect** services

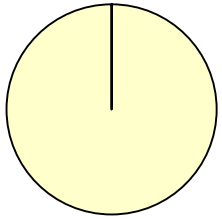
Influence of accessibility to forest to perceived source of ESs

Direct Services:

✓ Main food (rice)

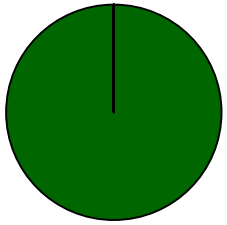


(**Close:** *n* = 66)

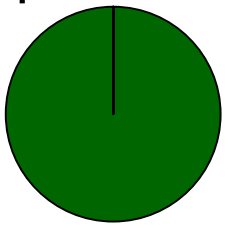


(**Far:** *n* = 65)

✓ Bird to be sold as pets



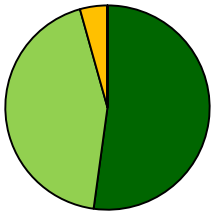
(**Close:** *n* = 20)



(**Far:** *n* = 3)

Indirect Services:

✓ Local custom of hunting game



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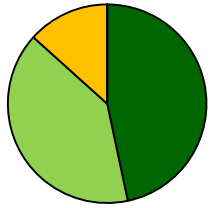
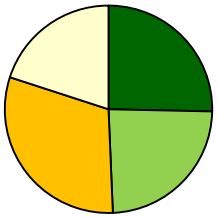
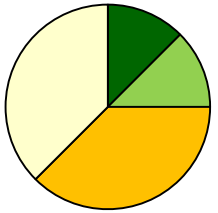


(**Far:** *n* = 65)

✓ Pollinators



(**Close:** *n* = 75)



(**Far:** *n* = 8)

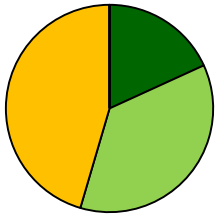
Remnant forest | Tree plantation | Agroforest | Agricultural land

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

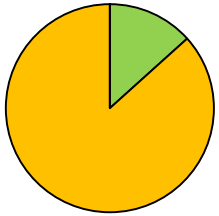
Influence of accessibility to forest to perceived source of ESs

Direct Services:

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

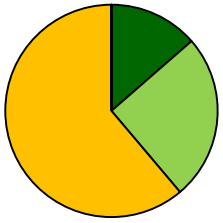


(**Close:** *n* = 121)

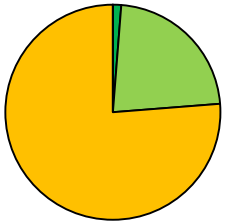


(**Far:** *n* = 30)

✓ Fuelwood (*P*<0.05)



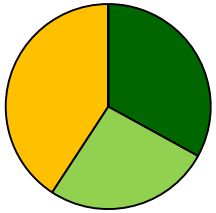
(**Close:** *n* = 103)



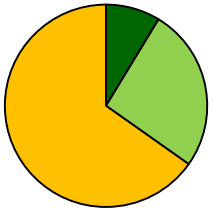
(**Far:** *n* = 80)

Indirect Services:

✓ Water regulation (*P*<0.01)

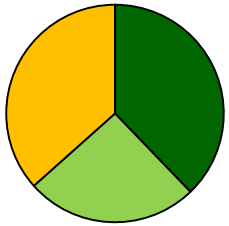


(**Close:** *n* = 66)

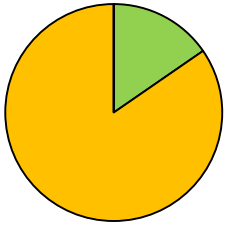


(**Far:** *n* = 65)

✓ Landslide prevention (P<0.001)



(**Close:** *n* = 82)



(**Far:** *n* = 39)

Remnant forest | Tree plantation | Agroforest | Agricultural land

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

Discussion

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**

Discussion

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	√	√			

Conclusion

- 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