



# Linking *Pteropus vampyrus* conservation to farmer's livelihood development in U Minh Thuong National Park, Vietnam

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## 1. INTRODUCTION

U Minh Thuong National Park (UMTNP) is one of two large areas of peat swamp forest remaining in Vietnam. The Park is not only home to abundant biodiversity but it is also of important cultural significance. UMTNP is considered one of the three highest priority sites for wetland conservation in the Mekong Delta.

At the UMTNP, *Pteropus vampyrus* is one of 8 species of bats discovered in 2000. The population of *P. vampyrus* has decreased rapidly in the past decade and is now on the brink of extinction and must be preserved. Success in bat conservation requires developing supportive conservation policies and improving livelihood for local farmers in the buffer zone of UMTNP who directly cause the decrease in *P. vampyrus* population.



Fig. 1. Study location map



Fig. 2-3. A canal (a) & flora ecosystem (b) in the park

## 2. OBJECTIVES

- Measure the current status of the population of *Pteropus vampyrus* at UMTNP;
- Plant fruit trees to provide food sources for *Pteropus vampyrus* within UMTNP;
- Assess income levels of local households and their livelihood's dependence on bats (*Scotophilus kuhlii*) to enlarge households income in the buffer zone of UMTNP;
- Determine the factors influencing the willingness-to-pay for bat conservation and household income;
- Propose policies and strategies for conservation of *P. vampyrus* associated with livelihood improvement strategies.

## 3. METHODS

### 3.1. Conceptual framework

- Bat populations are mainly influenced by food (A), climate (B), and human-induced disturbance (C), which is associated with different factors including livelihood system (D) of the farmers and their choice (E)

### 3.2. Regression models

- Ordinary Least Square model, regression tree model, logistic regression model

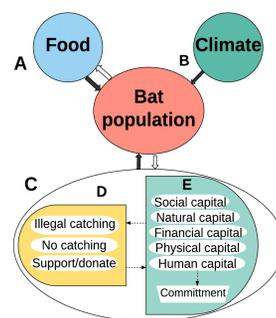


Fig. 4. Conceptual framework for bat conservation & livelihood strategy

## 3. METHODS (cont.)

### 3.3. Data collection & analysis

- Bat survey: 4 people used binoculars to count *Pteropus vampyrus* 3-4 times/month b/w June 2016-August 2017.
- Bat food: Bananas planted along the canal within the park.
- Household survey: questionnaire used to interview a total of 8 bat-growing households and randomly interview 280 households at 2 communes of the buffer zone of UMTNP, Minh Thuan and An Minh Bac.
- We used SPSS v22 (IBM Corp. USA), R software package, Stata v11 (Stata Corp LP, USA) to test, fix the data, describe the data, run regression models, draw the graphs.

## 4. RESULTS

### 4.1. Bat measurement



Fig. 5. *Pteropus vampyrus*

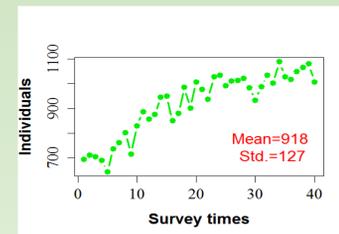


Fig. 6. *P. vampyrus* survey b/w June 2016 & August 2017

### 4.2. Food improvement for bats



Fig. 7. Planted bananas along a 2.2 km canal



Fig. 8. A 3-month old banana example

### 4.3. Bat's role in the farmer's livelihood



Fig. 9. Bat (*Scotophilus kuhlii*) house model

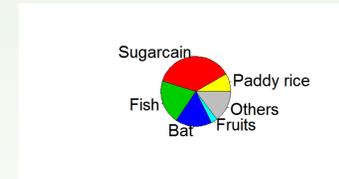


Fig. 10. Income structure of bat-growing households (N=8). Bat's revenue constitutes 16.8% of total household income.

### 4.4. Determinants of bat conservation & household income

Candidate Variable	Mean	SD	Logit model DV: WTP	OLS model DV: LNINCOM
AGEAVE	49.40	11.536	0.075xAGEAVE*	NI
EDUAVE	4.02	2.632	NI	NI
COMIT	0.96	0.186	NI	NI
FAMSIZE	4.27	1.359	NI	0.239xLNAMSIZE**
AGRILAND	41,225	4,425.539	NI	0.682xLNAGRILAND**
AGRIYEAR	18.61	9.029	0.061xAGRIYEAR**	NI
INCOM	54.98	31.701	0.02xINCOM***	NI
WTP	0.04	0.186	NI	NI

Note: N =280, DV: dependent variable, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; NI: variable not included in the model. AGEAVE: average age of house head & his/her spouse (year), EDUAVE: average school year of house head & his/her spouse (year), COMIT: have commitment not to catch bat (yes/no), FAMSIZE: family size (People), AGRILAND: total agricultural land (m<sup>2</sup>), AGRIYEAR: number of year working in agriculture (Year), INCOM: annual household income (Million VND), WTP: willingness-to-pay for bat conservation (Yes/No).

## 4. RESULTS (cont.)

### 4.4. Determinants of household income (cont.)

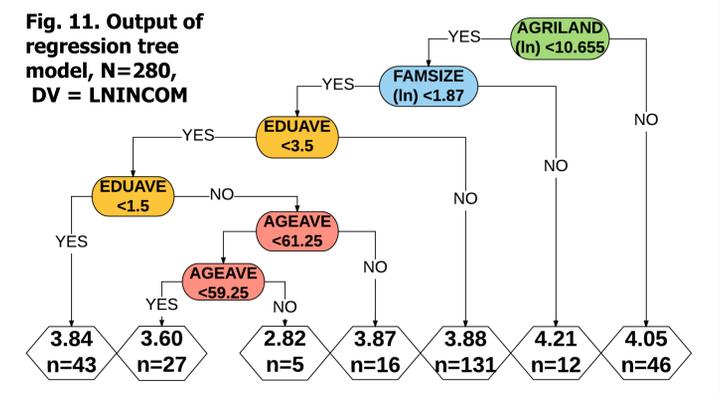


Fig. 11. Output of regression tree model, N=280, DV = LNINCOM

## 5. CONCLUSIONS

- Population of *Pteropus vampyrus* was 918 ± 127 observations and it tended to increase slightly in 2016-2017.
- 3.8 acres of banana were planted within the park.
- For bat-growing households, the role of *Scotophilus kuhlii* in household livelihood is relatively significant.
- A large majority of respondents committed not to catch Bat while a small proportion of respondents is willing to pay (WTP) for bat conservation. WTP was influenced by 3 key factors: average age of house head and the spouse, working years in agriculture, & income.
- Agricultural land size, family size were the two most important factors influencing total household income.
- Policy implications & recommendations: (1) prioritize rural labor quality improvement and diversify income sources including developing bat-growing model to improve people's livelihood, (2) promote the propaganda to enhance the locals' awareness of the bat, and (3) maintain bat monitoring, and upgrade the equipment for measuring bats more accurately.

## REFERENCES

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