Factors Determinant Bushmeat Consumption Pattern in 4 Provinces in Lao PDR*

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Abstract

The purpose of this study is to examine the factors influencing bushmeat consumption in Lao PDR. Logistic regression model analysis is used, which employed sample size of 654 households from four provinces in Lao PDR: Vientiane capital, Vientiane province, Luangprabang province, and Xiengkhuangprovince in 2018.

The study finds that gender, household expenditure, belief and law awareness, have the positive impact on bushmeat consumption. Wild-life policy-makers should be made more aware that conservation law has positively impact on bushmeat consumption, and thus, the government should put more effort in making the wildlife conservation law strictly followed. This finding might have significant impacts in reducing wild meat consumption in Lao PDR.

Keyword: Bushmeat; Consumption; Wildlife; Logistic Model

Introduction

Wildlife plays the major important role in balancing the environment, which helps to maintain the stability of nature and plant propagation (Kapoor, 2011). Wildlife is also the primary source of meat and income of people in many developing countries around the world (Milner-Gulland and Bennett, 2003). People depend on species a lot since before and, the need of using animal parts to make traditional medicine can also contribute to species decline, for example in china, Rhino horn was used as the medicine to relieve fevers and lower blood pressure. In 1990s, China detached the animal from its list of ingredients approved for manufacturing medicines; however, a few years ago, after the rumor that began flowing in Vietnam that rhino horn had cured a VIP of terminal liver cancer, the animals are, once again, being threatened (Joseph and Zielinski, 2011).

In an era driven by the globalized economy, one of the leading threats to an endangered wildlife is the consumer demand that is thousand miles away in terms of trade

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(Mason, 2017). The unsustainability of the bushmeat trade can be exacerbated by higher road density, as transportations open up the access to remote forested areas and to rural and urban markets; thereby dropping the opportunity cost of the bushmeat trade (Wikie et al., 2000). Wild animal trafficking global is estimated to be valuing more than US$8 billion a year globally, following only to the trade in illegal drugs, with profit margins more attractive than illegal arms dealing (Sain-Ley-Berry, 2000).

Laos is also one of the countries where wildlife encroachment and illegal wildlife trade market have caused serious declines in endangered species population (WWF, 2018). The major threats for wildlife in Laos are habitat loss and harvesting for food and Lao PDR, which has experienced unparalleled development over the past decades, driving, for instance, the construction of major highways and dams (J&C, 2013).

Rural communities in Laos earn nearly half of their incomes from harvesting and selling non-timber forest products, which means that expansion into forests and unplanned development would pose a considerable threat to Laos people and also the wildlife (J&C, 2013). In order to protect the wildlife, Laos' Prime minister's order No.5 was issued on May 8th, 2018, which aims to take strict actions on wildlife law enforcement, by means of national laws on the management and inspection on wildlife trade, and commitments to international law (WWF, 2018).

Despite the decline of wildlife in Laos, very few empirical studies examine the factors in influencing wildlife consumption. The study about wildlife trade and human health in Laos was conducted by Greatorex et al. (2016), which assessed the Zoonotic disease risk in markets.

As for this research study, we attempt to study a consumption pattern among people who live in the urban areas in Vientiane Capital, Vientiane Province, Luangprabang Province and Xiengkhuang Province, by using the Logistic Regression model.

Overview of the Wildlife in Laos

The Lao PDR still obscures a rich fauna, with many species' populations and their habits. 274 mammal species are reported in Laos, of which over classified as "large mammals", and the outstanding among them the Asian elephant, tiger and Saola, for example (WCS, 2019).

In recent years, Laos has caused the international attention, after the discovery of incredible variety of species that are new to sciences. In addition to mammals, Laos supports over 165 species of amphibians and reptiles, including such as the Rock and Burmese Pythons, king Cobras and the large and the noisy Takay Gecko (Gekko gecko), a portentous resident of many Lao houses.

However, Laos is becoming a nucleus for the trade in endangered species with foreign tourists, particularly from neighboring China, in stirring the demand for illegal products. It is said that tiger meat and bear paw are served on menu for the Chinese tourists in Northwest Laos (J&C, 2015), which makes some wild animals in Laos risk becoming endangered.

Literature Review

Van Song (2008) conducted a study about the illegal trade in wildlife in Vietnam, which analyzed the causes for the rapid growth in the trade and the crucial failures in the country's effort to control it. The study says that the government should strengthen the capability of the organizations responsible for fighting the trade and increase their budget. The study also highlights the need to use education to encourage people to stop consuming illegal wild life products.

Zhang et al. (2008) examined the wildlife trade, consumption and conservation awareness in Southwest China by gathering the data form trading hubs at ports, boundary markets, city market and stores. The result shows that around 60 percent of the respondents had consumed wild meat in the last two years, and, the main consumers are male and young people with high education levels and good incomes. The research indicated that law and regulation on wildlife trade control is insufficient.

Based on a structured survey and semi-structured interview, Drury (2011) studied the urban consumers demand for wild animal products in Hanoi, Vietnam, and investigated the social perceptions of wildmeat consumption. The study found that wildmeat is most generally consumed by successful, high-income, high status males of all ages and educational levels. The research found that the consumption was used as a standard to communicate prestige and obtain social influence.

Suwanarong et al. (2015) studied the hunting, food preparation, and consumption of rodents in Lao PDR, with 584 households in 29 villages, Khamkerd district, Bolikhamxay province, by applying Logistic model. The study found that gender, age, ethnic, and occupation have the impact on rodent consumption.

Kroos (2016) examined the risk factors that influence bushmeat consumption of Ebola hosts in an area peripheral to a high Ebola infection zone. The study found that educated persons were significantly more likely to consume bushmeat than persons who had never attended school, possibly due to enlarged income, and persons who keenly practice the religion animism had a decreased possibility of bushmeat due to religious leaders in discouraging bushmeat consumption during the epidemic. Moreover, the study shows that respondents who consumed domestic meat more than one time per month and lived more than ten kilometers from the bushmeat market were significantly less probable to consume bushmeat.

Bakkegaard et al (2017) studied the household determinants of bushmeat and eru (Gnetum africanum) harvesting for cash in The Democratic Republic of Congo, by using the Heckman selection model. The research shows that being local, higher household labor availability and higher asset endowment were positively related to selection into wild meat hunting, reflecting higher risk-carrying capacities, ease of access to equipment and resources and having more labors in the household lower the bushmeat consumption.

Method

To examine the factors influencing bushmeat consumption in Laos, four provinces were chosen to be the representative of our study. We collected through household surveys by randomly choosing people who consume and not consume wildmeat in the urban area of each one. The data was collected in August 2018.

The questionnaires have five sections: respondent's general information, house-headed information, household information, the reason of consuming and not consuming wildmeat.

The survey used face-to-face interviews with the respondent of each household, and in total, 654 households were randomly selected using a Yamane sampling formula (Yamane, 1967).

In this study, the dependent variable is to consume or not consume so, dummy dependent variable is used (1, 0), and Binary Logistic Regression Analysis is applied, which conducted by Greene, w (1997).

$$Prob\ (event) = \frac{e^{\beta_0+\beta_1 x}}{1+e^{-(\beta_0+\beta_1 x}} \text{ or } Prob\ (event) = \frac{e^{\beta_0+\beta_1 x}}{1+e^{-(\beta_0+\beta_1 x)}}$$

- β_0 and β_1 : are the coefficients derived from the variable
- X: is the explanatory variable
- e: is the error term.

In case, there are many variables (p variable) we can write the equation as below:

$$Prob(event) = \frac{1}{1+e^{-z}} \quad Z = \beta 0 + \beta 1x1 + \beta 2x2 + \cdots + \beta pxp$$

$$Z = \beta_0+\beta_1 x_1+\beta_2 x_2+\ldots\ldots+\beta_p x_p$$

In this study, we use consume bushmeat or not consume bushmeat (yes = 1; 0 = no) as the dependent variable, and there are 11 explanatory variables, so the logistic regression model is shown in the equation below:

$$P(consume_{t=1}) = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 Ethnic + \beta_4 educ + \beta_5 occu + \\ +\beta_6 status + \beta_7 HHS + \beta_8 lnexpend + \beta_9 GTP + \beta_{10} Beliefe + \beta_{11} law + u_i$$

Where β_0 is the constant coefficient; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}$ are the coefficients of the explanatory variables of gender, age, ethnic group, education, occupation, status, household size, household's expenditure, go to other province, belief that bushmeat is good for health and awareness of wildlife conservation law, respectively; u_i is the error term. The details of the variables for the Logistic regression are given in Table 1.

Table 1. The variables for regression

Variables	Definition		Expected sign	Sources of variable
Dependent variable				
Consume	**Bushmeat consumption**	**1 = consume** **0 = not consume**		
Explanatory variables				
Gender	Gender of respondent	1 = male 0 = female	+	Drury, R., 2011
Age			+	Drury, R., 2011
Ethnic	Ethnic group of respondent	1 = Lao 0 = others	+	Suwannarong et al, 2015
Educ	Education levels		-	Drury, R., 2011
Occu	occupation	1 = government officer 0 = others	+	Suwannarong et al, 2015
Status	Marital status	1 = married 0 = single	+	Suwannarong et al, 2015
HHS	Household size		-	Godoy, R et al, 2010
Expend	Household expenditure	Kib/Month	-	Fue, L, 2018
GTP	Go to other province	1 = yes 0 = never	+	Fue, L 2018
Belief	Belief that bushmeat is good for heath		+	Kotler, P, 1996
Law	Awareness of wildlife conservation law	1 = Yes 0 = No	+	Zhang, L et al ,2008

Results

The socio-economic characteristics of the respondents are shown in Table 2.

Table 2. The socio-economic characteristic of the respondents

Respondents characteristic	Frequency	Percent
Male	355	54.28
Female	299	45.72
Age		
Age < 21	65	9.94
21 – 30	200	30.58
31 – 40	186	28.44
41 – 50	120	18.34
< 50	83	12.7
Other ethnic group	165	25.23
Lao ethic group	489	74.77
Single	274	41.9
Married	380	58.1
Household size		
< 4	82	12.54
4 – 5	318	48.62
6 – 7	176	26.91
8 – 9	53	8.1
> 9	25	38.22
expenditure		
Minimum expenditure	150,000 Kib/Month	
Maximum expenditure	4,500,000 Kib/Month	
Never been to other provinces	267	40.83
Been to other provinces	387	59.17
Not believe that bush meat is good for health	249	38.07
Believe that bushmeat is good for health	405	61.93
Don't know conservation law	174	26.61
Know conservation law	480	73.39

Source: STATA 13, 2019

To estimate the factors determinant bushmeat consumption, Logistic regression model is applied. The logistic model might have econometric problem specifically multicollinearity, which can be investigated and removed during the estimation. Multicollinearity is a very severe problem when using Logistics method. If the coefficients of the correlations between the explanatory variables have an absolute value equal to or above 0.80, then the multicollinearity is severe (Gujariti, 1995). The explanatory variables for this study are verified to have no multicollinearity because the highest absolute value is 0.44, which is much less than the criteria value.

Table 3 show the marginal effect of factors influence bushmeat consumption.

Table 3. Factors determinant bushmeat consumption

Variables	Definition	dy/dx	P>z
Gender	Gender of respondent	.2173284	0.000***
Age	Age of respondent	.0026665	0.205^{ns}
Ethnic	Ethic group of respondent	-.0800587	0.16^{ns}
Status	Marital Status of respondent	.009621	0.848^{ns}
Edu	Education level of respondent	.0010061	0.889^{ns}
Occ	Occupation of respondent	.0287087	0.625^{ns}
HHS	Household size of respondents	.0205786	0.112^{ns}
Lnexp	Household expenditure of respondent	-.0784059	0.022**
Tgp	Ever gone to other province of respondent	.2557306	0.000***
Belief	Belief that bushmeat is good for health	.2243452	0.000***
Law	Aware of wildlife conservation law	.5106997	0.000***

Number of obs = 654
LR chi2(11) = 218.63
Prob > chi2 = 0.0000
Pseudo R2 = 0.2443

Note: * 10% significant ** 5% significant *** 1% significant
ns has no significant
dy/dx marginal effect

Source: STATA 13, 2019

Gender, as expected, the male gender has positively correlated with bushmeat consumption, because men trend to love adventure activities like hunting bird hunting, for instance. If the respondent is a male, the probability of consuming bushmeat is 21.73 % higher compare to female with 1 % statistically significant.

Expenditure (household expenditure), the result shows that the expenditure has negatively correlated with bushmeat consumption, because the household that has high expenditure in the house trend to has meal at the restaurant more than cook at home, and they may have other payment that more important than buying illegal bushmeat. Thus, if the household expenditure increases 1 %, the probability of bushmeat consumption decrease -0.00078 % with 5 % statistically significant.

GTP (go to other provinces), was expected to be positively correlated with bushmeat consumption, because in Laos, wild meat is sold beside the street and in local market in the rural area. Thus, a person who ever been to other province, the probability of consuming bushmeat is higher than a person who never been to others province 25.57% with 1 % statistically significant.

Belief (believe that bushmeat is good for health), the result is as expected, the belief has positively correlated with bushmeat consumption because many Lao people belief that some wild animals are good for health and can cure disease like eating turtle can make you have a long lifespan. So, it is shown that a person who has a belief, the probability of bushmeat consumption is higher than a person who not believe 22.43 % with 1 % statistically significant.

Law (aware of wildlife conservation law), the result is quite surprisingly because the awareness of conservation law has positively correlated with bushmeat consumption. The probability of a person who know the conservation law is higher than a person who don't know the law 51.10% with 1% statistically significant. This means even if people know the conservation law, they don't care and continue eating wild meat, moreover, this can mean that the conservation law is insufficient.

As for age, status, education, occupation and household size factors, they are positively correlated with bushmeat consumption, but ethnic has the negative correlation. However, all of them is not statistically significant, which mean they have no impact on bushmeat consumption.

Conclusion and Recommendation

There are many influences that affect bushmeat consumption. The main purpose of the present study is to examine factors determining bushmeat consumption in Lao PDR. The study is based on cross-sectional data, which were collected from four provinces: Vientiane Capital, Vientiane province, Luangprabang province and Xiengkhuang province, with 654 samples, in 2018. The Logistic Regression Model was applied in this study.

The study found that gender, been to other provinces, belief and law, have positively affected the bushmeat consumption, while the expenditure has negatively affected the bushmeat consumption in the study areas. In addition, in order to protect the wild life, the collaboration at all scales, involving local people, government and scientists are needed, and educate people with the negative effect of wild meat, because from the survey, most of the respondents said that bushmeat is delicious that is why they consume bushmeat.

This paper has some limitations. First, the cross-sectional data might only show the short-term effect and might not anticipate the long-term impact, which might have been possible to ascertain by using panel data. Second, the sample size is quite small for the 4 provinces with 654 sample. Third, we need more advanced econometric methods to examine the factors determinant bushmeat consumption, and we need more time to investigate the real causes.

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