Adaptation to Flash Floods and Landslides of Rural Households in the Northern Vietnam: An Insight into the Key Drivers

Pham Thi Thanh Nga[1], Archana Raghavan Sathyan[2], Matthias Garschagen[1] and Jakob Rhyner[1]

1 United Nations University, Institute for Environment and Human Security, Germany
2 Justus-Liebig University Giessen, Institute for Landscape Ecology and Resources Management, Germany
Corresponding author: nga.pham@ehs.unu.edu or s7napham@uni-bonn.de

Introduction

- ✓ Flash floods and landslides have been threatening to the life and agricultural productivity of the rural people in the country, especially to those whose livelihoods are significantly contingent on agriculture and the natural resources (Marconi, Marincioni, & Tran, 2011; MONRE, 2017; World Bank, 2011).
- ✓ Adaptation can considerably reduce the vulnerability to natural hazards (IPCC, 2001).
- ✓ What are the barriers farmers affected to their adaptations? And;
- ✓ What are the driving forces of farmers´ adaptation choices to flash floods and landslides?

Research method

Data were obtained from a household survey, conducted from February to April 2016 in Van Yen district, Yen Bai province. The total surveyed samples are 405 households in three commune namely: An Binh, An Thinh, and Dai Son.

Household survey, 2016

The Multivariate Probit (MVP) model is used in the study to identify the primary determinants affecting rural households´ decisions to adapt to flash floods and landslides.

$$A_i = \beta_0 + \sum_j \delta_j z_{ij} + k_i$$

$$A_{ni} = \begin{cases} 1 \text{ if } A_{ni} = \beta_n + \sum_j \delta_{nj} z_{ij} + k_{ni} > 0 \\ 0 \text{ otherwise} \end{cases}$$

Where:

A_i stands for adaptation choice i

δ_j is the parameters to be estimated

z_{ij} stands for households´attributes.

Results

Table 1: Explanatory variables in the adaptation model

Variables	Frequency/Mean	Percentage/Standard deviation
Age (years)	46,70	11,36
Level of education (degree)	1,99	0,99
Ethnic group (0/1)	260	64,20
Household status (Poor household) (0/1)	116	28,64
Farm income (million VND)	55,99	80,55
Non farm income (million VND)	35,06	42,62
Distance to market (km)	3,73	2,68
Land ownership (0/1)	293	72,35
Farm size (ha)	2,31	2,52
Access to irrigation (0/1)	261	64,44
Contact with extension services (0/1)	98	24,20
Credit availability (0/1)	259	63,95
Climate information (0/1)	367	90,62

Note: Frequency and Percentage in case of qualitative (dummy) variables; Mean and Standard deviation in case of quantitative (continuous) variables.

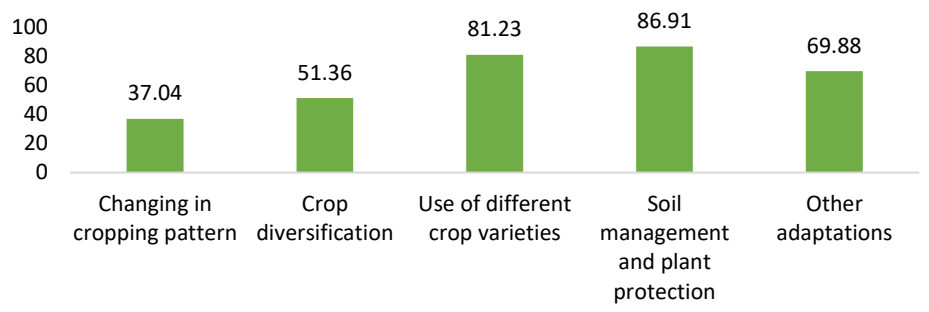

Figure 1: Adaptation options implemented by households

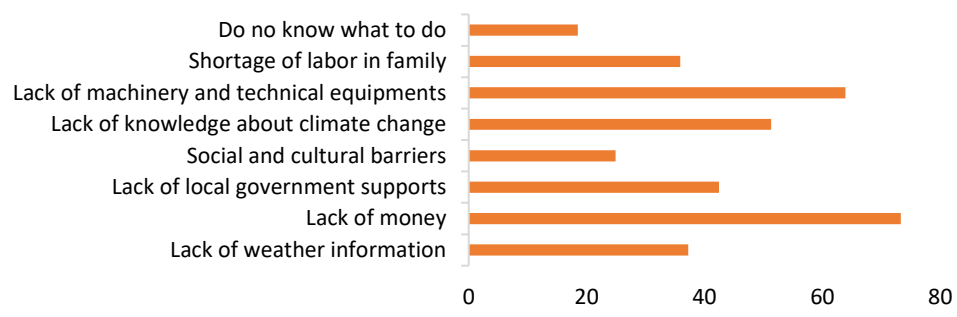

Figure 2: Farmers ´difficulties in coping with and preventing flash floods and landslides

Table 2: Multivariate probit model of determinants of farmers´adaptation choices

Explanatory variables	Changing in crop pattern	Crop diversification	Changing in crop varieties	Soil management and plant protection	Others
	Coefficient	*Coefficient*	*Coefficient*	*Coefficient*	*Coefficient*
Age of household head	0.18	-0.41***	0.11	-0.11	-0.08
Education	-0.15*	-0.03	0.02	0.07	-0.06
Ethnic group	0.36**	-0.26	0.40**	-0.33	0.13
Household status	-0.33**	0.07	0.13	-0.05	0.03
Land ownership	-0.04	0.40**	0.04	0.12	0.10
Farmsize	-0.07**	0.02	-0.01	0.11*	-0.03
Irrigation	0.28*	-0.21	0.06	0.15	0.31**
Contact extension	-0.06	-0.28*	-0.18	-0.26	-0.17
Distance to market	0.03	-0.10***	0.03	-0.03	0.03
Farm income	0.09	0.25***	0.13*	-0.01	-0.02
Non-farm income	0.02	0.00	0.05	0.04	-0.02
Access to credit	0.12	0.23	0.10	0.09	0.10
Climate information	0.56**	-0.03	0.09	-0.04	-0.08
Constant	-2.52*	2.27*	-0.87	1.66	1.03
Log likelihood = -1050.7533; Wald chi2 (60) = 138.37; Prob > chi2 = 0.0000					

, **, * are significant at 10%, 5% and 1%, respectively.*

Conclusions

- ✓ 97% of the inhabitants practice at least one adaptation strategy in the context of flash floods and landslides.
- ✓ Farmer's adaptation decisions are determined by the age of household head, education level, ethnic group, household status, land ownership, farm size, irrigation, contact with extension service, distance to market, farm income and climate information.
- ✓ Income from the off-farm job and credit availability do not determine the farmers´ choice in adaptation strategies.

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