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3 January 2019

Online at <https://mpra.ub.uni-muenchen.de/95936/>
MPRA Paper No. 95936, posted 13 Sep 2019 09:58 UTC

Is landholding a potential barrier to adopting profitable livelihoods in the Mekong Delta region in Vietnam¹?

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Abstract

Using secondary data on rural households in the Mekong Delta region of Vietnam, our study is the first to identify (i) what livelihoods are adopted by rural households, (ii) which ones are profitable and which are not, and (iii) whether access to various types of land is an important factor affecting households' choice of remunerative livelihoods. Considering various income sources, we apply cluster analysis techniques to offer the first classification of five types of livelihood adopted by local households. We then compare livelihood outcomes across livelihood groups using Bonferroni pairwise tests and quantile functions (Pen's parades). It was found that households engaged in farm work, formal wage-earning work and non-wage work livelihoods obtained higher levels of income than did those with livelihoods depending on informal wage-earning work or non-labor income sources. Using a multinomial logit model, we also examine factors affecting choices of income-earning activities, and find that several types of land are positively associated with the choice of high-return livelihoods, implying that lack of access to land is a potential obstacle to adopting profitable livelihoods. Fortunately, education is found to play a major role in the pursuit of remunerative livelihoods, which suggests that better education would help households move from low- to high-return activities.

Keywords: Cluster analysis; household incomes; land; livelihoods; sustainable livelihood; Mekong Delta

¹ The revised and final version of this paper has been published in *Human Ecology*, Springer.

<https://link.springer.com/article/10.1007/s10745-019-00101-y>

This research is funded by *National Economics University*, Hanoi, Vietnam

1. Introduction

Vietnam is a country with little arable land. In 2016, arable land per capita was slightly less than 0.074 hectares, which is much lower than the world average (0.192 hectares), and than the average for lower- and middle-income countries (0.167 hectares).² However, Vietnam is endowed with fertile land and weather favourable for agriculture and this has enabled the country's agricultural sector to make great progress over the past two decades (WB, 2011, 2016). Although Vietnam once endured starvation, its per capita food yield now belongs in the top tier of middle-income countries. Also, the country has succeeded in exporting a large quantity of agricultural products and now ranks among the top five global exporters in products such as rice, rubber, cashews, coffee and pepper (WB, 2016).

At the household level, land ownership may determine wellbeing in various ways. As a productive asset, the ownership of more land allows households to expand their scale of production, which in turn helps them create more jobs, and increase productivity and income for family members (Finan, Sadoulet, & De Janvry, 2005). Households with landholdings are also more likely to obtain better access to both formal and informal credit (Finan et al., 2005; Lipton, 1985). Land ownership has additional functions, serving as an asset, providing insurance for unemployed farmers, and reducing economic risks or shocks (T. Q. Tran, 2014). Several studies have confirmed the importance of land and land reforms for poverty reduction in many countries (C. V. Nguyen & Tran, 2013). It is evident that steady advances in the productivity of smallholders and their agricultural intensification through the 1990s have played an important role in Vietnam's remarkable achievements in poverty alleviation, national food security, and social stability (WB, 2016).

However, conditions for agricultural development vary substantially across the regions of Vietnam. The land is more fertile and the climate more favourable for agricultural production in the Central Highlands, Southeast and Mekong Delta regions. Combined, these regions now contribute about 60% of the country's gross agricultural output and more than 80% of its agricultural exports (WB, 2016). In particular, the Mekong Delta region accounts for about one third of gross value-added agricultural income (WB, 2016). As a result, highly productive commercial rice growers are concentrated in this region, while subsistence farmers are found mainly in other regions (WB, 2016). This situation implies that natural resources, especially

² <https://data.worldbank.org/indicator/AG.LND.ARBL.HA.PC?view=map>

land, may have varying effects on the livelihood of rural households, depending on the geographical region.

A large number of studies have examined the role of land in household wellbeing in rural Vietnam. Ravallion and Van de Walle (2008) find that rising landlessness does not increase rural poverty in the aggregate. The study by Tran, Lim, Cameron, and Van (2014) indicates that land loss (due to urbanization) does not have a negative impact on either income or consumption among households in Vietnam's peri-urban areas. Nguyen and Tran (2013) analysed the effect of land ownership on household welfare during the period of rapid economic transformation in rural Vietnam. They found a U-shaped relationship between land ownership and household welfare, which suggests that both acquiring cropland and moving out of farming are associated with higher levels of income and expenditure. Notably, their study reveals that the relationship is stronger in less developed communes, implying that the benefits of structural transformation may decline at higher levels of development. Other studies confirmed the positive effect of cropland ownership on poverty reduction and household income in the Northwest region (Tran, 2015; Tran, Nguyen, Vu, & Nguyen, 2015), the North Central region (Nguyen & Tran, 2018) and the Central Highlands region (Chi, 2018).

While most existing studies concentrate on the way the availability of farmland directly affects household welfare, very few attempt to answer the question whether limited landholdings may be a potential obstacle to pursuing high return livelihoods in rural Vietnam. In addition, few studies focus on the Mekong Delta region where the land is fertile and the weather favourable for agricultural production. This gap in the literature has motivated us to conduct the current study, which has two main merits. *First*, we provide a classification of various types of livelihood pursued by local households, using cluster analysis techniques. This method allows us to identify mutually exclusive subgroups of observations from a larger aggregate population (Punj & Stewart, 1983). *Secondly*, we answer the question as to which livelihood strategies offer higher returns and whether landholding is a factor determining the adoption of profitable livelihood strategies.

We identified five types of livelihood adopted by local households and found that livelihood strategies based on farm work, formal wage-earning work and non-wage work offered higher returns than did those based on informal wage-earning work or non-labor income sources. Notably, our econometric analysis reveals that landholding is positively associated with the choice of high-return livelihoods. This suggests that the lack of access to land is really a potential barrier to the pursuit of remunerative strategies. Fortunately, education is found to play a major

role in the pursuit of gainful livelihoods, which suggests that better education would help households move from low- to high-return activities. We also find that households living in communes, where roads and transport vehicles are available, have greater opportunity to pursue high-return livelihoods.

2. Data and methods

3.1 Data

The current study utilizes data taken from the 2016 Vietnam Household Living Standard Survey (VHLSS) of about 7,000 households living in the rural Mekong Delta region. The survey was implemented by the General Statistics Office of Vietnam (GSO) with technical help from the World Bank. Covering around 46,000 households for the whole country, the survey is representative at the national and regional levels (Vietnam is divided into six geographic and eight economic regions). The data on households and individuals contain detailed information about basic demography, employment and economic activities, education, health, economic activities, housing, durable goods and various types of land. The household and individual data were combined with commune data recording the natural and socio-economic characteristics of the communes in which households reside. The combined data allow us to investigate both household and commune-related factors affecting the choice of household livelihoods.

3.2. Methods

Identifying livelihood strategies pursued by local households

The classification of household livelihood strategies is of great importance to both academics and policy makers (Tran, Tran, Tran, & Nguyen, 2018; Tran, Lim, Cameron, & Van, 2014). Researchers can more readily predict the behaviour of households on the basis of their membership in groups, where they have certain properties in common (Serneels et al., 2009). One of the statistical techniques available for classification purposes is cluster analysis. From a larger aggregate group, this technique classifies a set of observations into two or more mutually exclusive, meaningful subgroups of observations (Punj & Stewart, 1983). The objective of cluster analysis is to divide a system of organizing observations, in this case relating to households, into various groups where group members share similar characteristics (Serneels et al., 2009). The method has been widely used in many studies on rural household livelihoods (Jansen, Pender,

Damon, Wielemaker, & Schipper, 2006; Serneels et al., 2009; Tran, Lim, Cameron, & Van, 2014; Van den Berg, 2010).

Empirical studies have often used income components by source as main input variables for classifying household livelihood strategies (Tran et al., 2018). The rationale is that income from different sources is the result of work time and livelihood assets allocated to various economic activities. Thus, we employ cluster analysis techniques to discover what livelihood strategies were pursued by local households, using income data for five sources, as given in Table 1.

Table 1: Income from five sources

Categories	Definitions
1. <i>Farm work</i>	Self-employment in household agriculture, including crops and livestock production and other related activities.
2. <i>Non-wage work</i>	Self-employment in non-farm activities (non-farm household businesses).
3. <i>Informal wage-earning work</i>	Wage-earning work that is often casual, low-paid and usually requires little or no education. Informal wage earners are often manual laborers who work for other individuals or households without a formal labor contract.
4. <i>Formal wage-earning work</i>	Regular, relatively stable wage-paying work with a formal labor contract, in factories, enterprises, state offices and other organizations, often requiring skills and higher levels of education.
5. <i>Non-labor sources</i>	Income from remittances, interest, rentals, subsidies, scholarships, and other income.

Following Punj and Stewart (1983), we applied a two-stage procedure for cluster analysis. First, we employ a hierarchical method, using the Calinski stopping rule to seek the optimal number of clusters (Halpin, 2016). The results show that the largest value of Calinski/Harabaz pseudo-F is 0.4781, corresponding to the optimal number of five groups. Cluster analysis was then performed with five groups, using k-mean clustering. Finally, five livelihood groups are identified. Their corresponding household income structures are given in Figure 1, including (i) non-labor income; (ii) formal wage-earning work; (iii) non-wage work; (iv) farm work; and (v) informal wage-earning work.

Measuring livelihood outcomes

Based on the classification into five types of livelihood pursued by local households, we carry out a descriptive analysis of household characteristics according to their choice of livelihood strategies. Following previous studies (Nielsen, Rayamajhi, Uberhuaga, Meilby, & Smith-Hall, 2013; Tran et al., 2018), we compare household per capita income across livelihood groups using Bonferroni pairwise tests and quantile functions (Pen's parades). Per capita income

is hypothesized to highlight the expected result of the livelihood strategy chosen. The estimate of per capita income also indicates that a household's choice of a low-return livelihood, or minimal chance of earning higher income, may reflect the fact that these households face obstacles preventing or limiting the pursuit of more remunerative livelihoods (Nielsen et al., 2013). Using Dunn's multiple-comparison test for stochastic dominance with a Bonferroni correction, we also examine the link between the proportion of households whose living conditions are improving³ and the choice of livelihood strategy.

Econometric specification

Since the choice of livelihood strategy is a polychotomous variable, a multinomial logit model (MNL) was utilized to examine the determinants of a household's choice of income generation. Let P_{ij} ($j=1, 2, 3, 4, 5$) denote the probability of a household choosing a given livelihood strategy i , with $j=1$ if the household adopts a non-labor income livelihood, $j=2$ if the household pursues a formal wage-earning work livelihood, $j=3$ if the household chooses a non-wage work livelihood, $j=4$ if the household takes up a livelihood in farm work, and $j=5$ if the household has an informal wage-earning work livelihood. The multinomial logit model is then obtained by:

$$P_{ij}(j = k|X_i) = \frac{\exp(\beta_k X_i)}{\sum_{j=1}^5 \exp(\beta_j X_i)} \quad (j = 1,2,3,4,5) \quad (1)$$

In order to construct the model identified, β_j should be set to zero for one of the categories, and coefficients are then interpreted with respect to that category, called the reference or base category (Cameron & Trivedi, 2005). Thus, set β_j to zero for one livelihood group (say, the informal wage-earning work group), then the MLM for each group can be rewritten as:

$$P_{ij}(j = k|X_i) = \frac{\exp(\beta_k X_i)}{1 + \sum_{j=1}^5 \exp(\beta_j X_i)} \quad (j = 1,2,3,4) \quad \text{and} \quad P_{ij}(j = 1|X_i) = \frac{1}{1 + \sum_{j=1}^5 \exp(\beta_j X_i)} \quad (2)$$

Equation (3) was used to estimate factors associated with livelihood choice among households, where β_i is the parameter that needs to be estimated; X_{ij} is a vector of household characteristics; Z_{ij} represents various types of land; C_j is the commune-related variable and ε_{ij} is an error term.

³ This is question 17 in Section 8 which asks the household head, "Have living conditions in your household improved, compared with 5 years ago (2010)?"

$$P_{ij}(j = k|X_i) = \beta_0 + \beta_1 X_{ij} + \beta_2 Z_{ij} + \beta_3 C_j + \varepsilon_{ij} \quad (3)$$

Following previous studies (Jansen et al., 2006; Tran, Lim, Cameron, & Vu, 2014; Van den Berg, 2010), we assume that a household's choice of livelihood is determined by fixed or slowly changing factors, including the household's natural and human capital, and commune-related variables. Other livelihood assets, such as social, financial, and physical capital, however, are more likely to be jointly determined with, or even determined by, the choice of livelihood (Jansen et al., 2006). Thus, we can minimize potential endogeneity issues by not including such livelihood capital in the regression model.

Natural capital includes the size of various types of land (owning more land promotes farming activity). Human capital is represented by household size and its dependency ratio (this ratio is calculated by the number of household members aged under 15 and over 59, divided by the total members aged 15-59) (both reflect labor endowment). Ethnicity, the age and gender of the household head, and the average years of formal schooling of the household head (requirements for formal wage-earning work) were also included as explanatory variables. Moreover, we included in the model other commune-related factors, such as natural disasters, geographical region (e.g., coastal vs. inland areas), road access and the availability transport vehicles (opportunities for nonfarm jobs in the communes). The definition and measurements of included variables are given in Table 2.

3. Results and discussion

3.1. Descriptive statistics for household livelihoods

Figure 1 shows five livelihood groups that were identified via cluster analysis techniques. The data in Table 2 indicates that specializing in farming activities emerges as the most popular strategy, with about one third of total households in this livelihood group. Next are those whose livelihoods are based on informal wage employment (23%). The proportion of households pursuing formal wage-earning work was about 16%, a proportion similar to those in non-wage livelihoods, while about 13% engage in livelihoods that depend on non-labor income sources.

Five livelihood groups, with their corresponding household income structures, are given in Figure 1. On average, non-labor income sources contribute about 77 % of the total income of households in non-labor livelihoods. The average contribution of formal wage income was about 66% of total income among those with livelihoods specializing in formal wage-earning work, while the average share of informal wage income accounted for about 71% of total income among those with informal wage-earning livelihoods. On average, income from non-wage work and

farm work contributed about 73% and 77%, respectively, of total income among those with non-wage work livelihoods and those with farm work livelihoods.

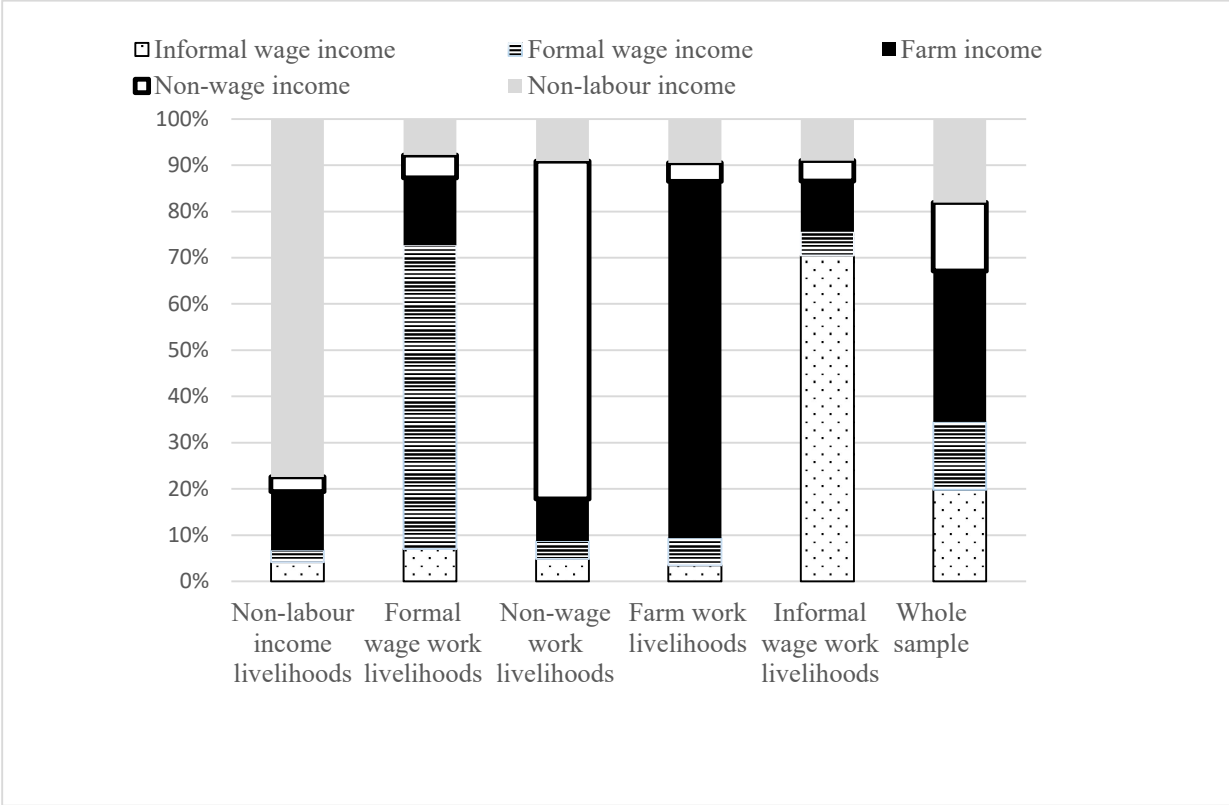


Figure 1: Household income structure by livelihood group
 Source: Authors' calculations from VHLSS 2016 data.

The main features of household characteristics according to their livelihood strategies are presented in Table 2. Regarding natural assets, Table 2 shows that average annual cropland per household is about 4,929 m². The corresponding figures for perennial, forest and aquaculture land are about 1,026 m², 162 m², and 1,629 m², respectively. As shown in Figure 2, however, inequality in land ownership is extreme. The figure reveals that about 55% of the sample had no annual cropland and about 77% had no perennial cropland. Unsurprisingly, the data show that on average, households pursuing farm-work livelihoods owned larger land holdings of all three types than did other livelihood groups.

On average, household heads engaged in non-wage work and formal wage-earning livelihoods had more years of formal schooling than did those of households with non-labor, farm work, and informal wage-earning livelihoods. Household heads with non-labor livelihoods, on average, were much older than those adopting other livelihood strategies and were also characterised by a larger household size and higher dependency ratio than those adopting other livelihood strategies.

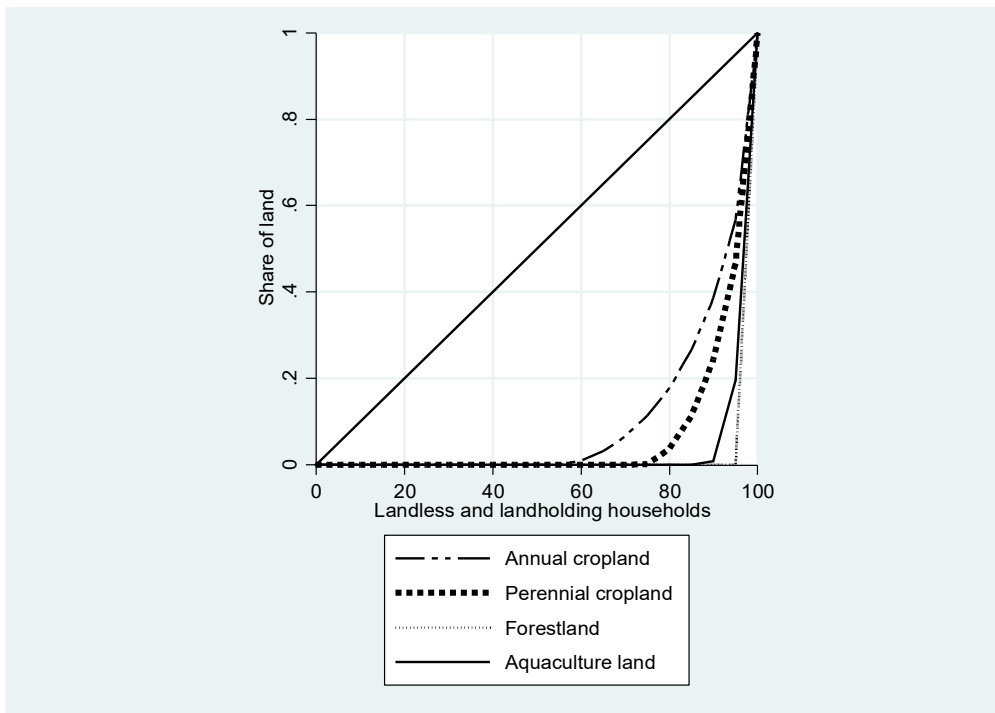


Figure 2: Lorenz curves for various types of land
 Source: Authors' calculations using VHLSS 2016 data.

Figure 3 records mean livelihood outcomes by livelihood group. It shows that on average, households with livelihoods in farm work, formal wage-earning work and non-wage work had higher levels of per capita income than did those with livelihoods based on non-labor income and informal wage-earning work. Table 2 indicates that the highest poverty rate was observed in households in the non-labor income livelihood group (12%), followed by those with farm work livelihoods (7%). The corresponding figures for those depending on formal wage-earning work, non-wage work and informal wage-earning work were only 2%, 2% and 5%, respectively.

Interestingly, Figure 4 reveals that about 77% of all households answered that their living conditions had improved compared with 5 years ago. However, there were substantial differences in this answer, depending on their livelihood strategy. Specifically, the proportion of households that had secured better living conditions was only 59% among those with non-labor livelihoods, followed by those with livelihoods based on informal wage-earning work (69%). The corresponding figures were markedly higher for those in formal wage-earning work (85%), non-wage work (83%), and farm work livelihoods (80%).

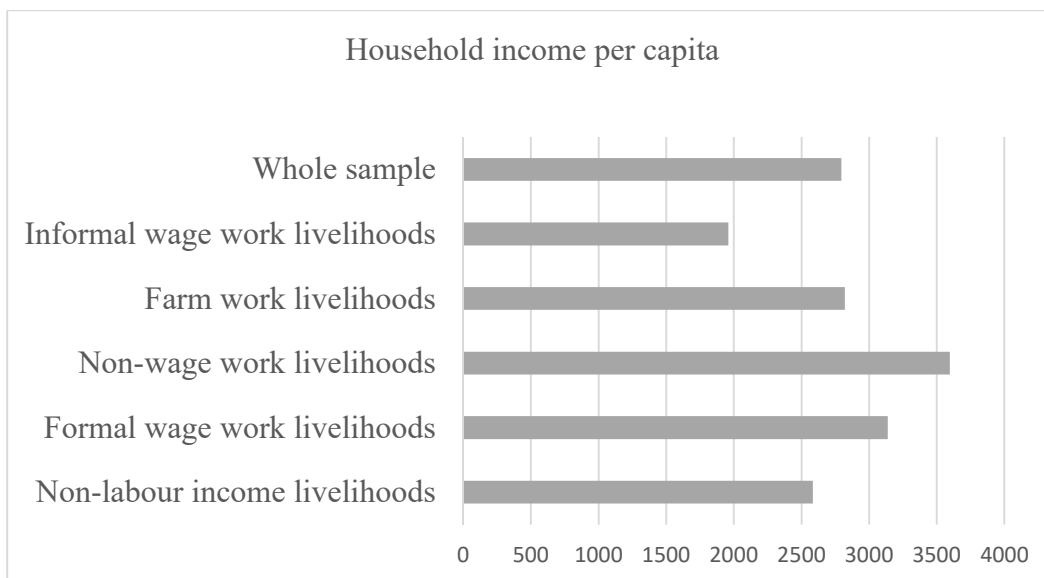


Figure 3: Household income per capita by livelihood strategy.

Source: Authors' calculations, based on VHLSS 2016 data.

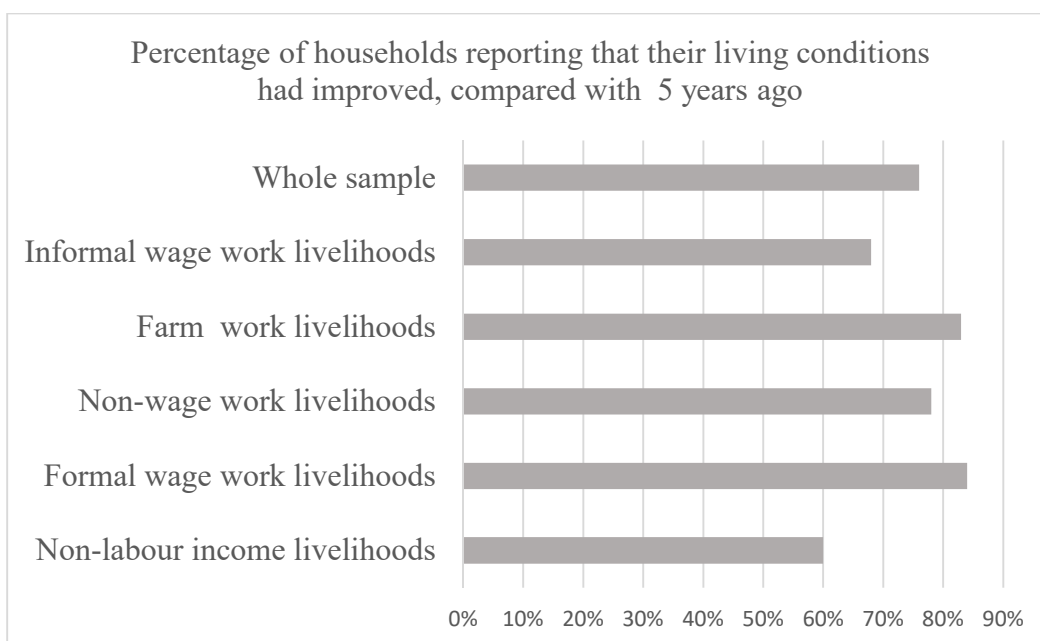


Figure 4: The percentage of households with improved living conditions, by livelihood strategy.

Source: Authors' calculations, based on VHLSS 2016 data.

3.2. Household wellbeing compared across livelihood strategies

Table 3 compares household welfare across livelihood groups. We ranked the outcomes for each livelihood strategy in terms of household income per capita, using Bonferroni pairwise tests across five livelihood groups. The results show that the income gap is large and statistically highly significant across groups. For instance, they show that on average, households in informal wage-earning work earn monthly per capita income that is 980,000 VND, 1,209,000 VND, and 900,000 VND lower than the income of those with formal wage-earning work, non-wage work and farm work, respectively. Similarly, lower income levels are observed for those adopting a livelihood based on non-labor income sources. In general, the findings confirm that there are two groups of households — those with high-return livelihoods and those with low-return livelihoods. The former are represented by those in farm work, formal wage-earning work and non-wage work, while the latter consist of those whose livelihoods rely on non-labor income sources or informal wage-earning work. We also rank livelihood strategy outcomes using a Pen's parade graph or quantile functions. Figure 5 shows that many observations for high return livelihoods overlap. Consequently, it is unclear which strategy in this group brings the highest return and which the lowest. This is also the case for the low return livelihood group. However, the figure indicates that three strategies in the high-return livelihood group achieved higher income levels than did those in the low-return group in almost the same percentiles, suggesting that these three strategies are more likely to yield higher incomes compared to the latter. The quantile functions, therefore, confirm the Bonferroni test results and combined, show that the former are superior to the latter, assuming that households try to maximize their income.

Interestingly, the result from the multiple comparison Dunn's test in Table 4 confirms that there is a close link between the livelihood strategy pursued by a household and improvement in their living conditions over the past 5 years. Overall, the finding implies that households engaged in formal wage-earning work, farm work and non-wage work livelihoods are more likely to achieve better living conditions than are those undertaking informal wage-earning work or non-labor livelihoods.

Table 2: Household and commune characteristics by livelihood strategy, Mekong Delta region, Vietnam

Livelihood strategies	Non-labor income		Formal wage work		Non-wage work		Farm work		Informal wage work livelihoods		All households	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Household characteristics</i>												
Household head gender: 1=male; 0=female	0.57	0.49	0.76	0.43	0.75	0.43	0.85	0.35	0.73	0.44	0.76	0.43
Age of household head (years)	62.20	13.90	50.66	12.37	50.39	12.56	52.94	12.65	50.34	12.53	52.81	13.30
Education: years of formal schooling of household head	4.32	3.48	7.68	4.85	6.56	3.78	5.77	3.42	4.67	3.36	5.76	3.90
Ethnicity of household head: 1=majority; 0=minority	0.91	0.29	0.94	0.24	0.94	0.25	0.94	0.24	0.90	0.30	0.92	0.26
Marital status of household head: 1=married; 0=single	0.05	0.21	0.02	0.15	0.02	0.16	0.01	0.12	0.03	0.16	0.02	0.15
Dependency ratio ^a	0.59	0.37	0.30	0.23	0.34	0.26	0.35	0.28	0.31	0.24	0.36	0.29
Household size: total number of family members	2.65	1.48	4.07	1.46	3.81	1.48	3.88	1.52	3.85	1.43	3.73	1.54
Annual cropland: m ²	2824	7325	3572	6337	2414	5769	10294	18301	1355	3178	4929	11919
Perennial cropland: m ²	821	2235	1007	2565	666	2162	1700	4158	465	1467	1026	2952
Forestland: m ²	46	833	60	916	116	1773	381	3724	28	576	162	2290
Aquaculture land: m ²	628	2881	612	4012	744	4730	3894	10193	380	2772	1629	6673
Residential land and gardens: m ²	129	412	183	614	100	387	277	805	86	276	171	581
Monthly household per capita income (in thousands of VND)	2272	4344	2857	1729	3086	5036	2778	3481	1877	1057	2564	3351
Living conditions improved ^b : 1=yes; 0=no	0.59	0.49	0.85	0.36	0.80	0.40	0.83	0.37	0.69	0.46	0.77	0.42
Poverty status: 1=yes; 0=no	0.12	0.32	0.02	0.15	0.02	0.14	0.07	0.25	0.05	0.22	0.06	0.23
<i>Commune characteristics</i>												
Prone to natural disasters: 1=yes; 0=no	0.49	0.50	0.49	0.50	0.47	0.50	0.49	0.50	0.45	0.50	0.48	0.50
Coastal area: 1=yes; 0=inland delta area	0.09	0.28	0.05	0.23	0.09	0.28	0.13	0.33	0.10	0.30	0.10	0.30
Transport vehicles: 1=yes; 0=no	0.59	0.49	0.54	0.50	0.60	0.49	0.53	0.50	0.56	0.50	0.56	0.50
Road access: 1=yes; 0=no	0.84	0.37	0.88	0.33	0.89	0.32	0.75	0.44	0.85	0.36	0.83	0.38
Observation	941		1,149		1,091		2,255		1,626		7,062	

^a This ratio is calculated by the number of members aged under 15 and over 59, divided by the number of members aged 15-59. SD: standard deviation. ^b this is question 17 in Section 8 which asks the household head, "Have living conditions in your household improved, compared with 5 years ago (2010)?"

Source: Authors' calculations based on VHLSS 2016 data. US \$1 = about 22,000 VND in 2016.

Table 3

Multiple Comparison of Household Per Capita Income Across Livelihood Groups Using the Bonferroni Method

Row Mean – Column Mean	Non-labor income	Formal wage work	Non-wage work	Farm work
Formal wage work	585 (0.00)			
Non-wage work	814 (0.00)	229 (1.00)		
Farm work	505 (0.00)	-79 (1.00)	-309 (0.12)	
Informal wage work	-395 (0.04)	-980 (0.00)	-1209 (0.00)	-900 (0.00)

Note: Results reported are mean differences in monthly per capita household income; *P*-values are given in parentheses. Unit: 1,000 VND. US \$1 = about 22,000 VND in 2016.

Source: Authors' calculation based on 2016 VHLSS.

Table 4

Multiple Comparison Dunn's Test of the Improvement in Living Conditions over 5 Years across Livelihood Groups Using Rank Sums

Column Mean – Row Mean	Non-labor income	Formal wage work	Non-wage work	Farm work
Formal wage work	-0.26 (0.00)			
Non-wage work	-0.21 (0.00)	0.05 (0.02)		
Farm work	-0.24 (0.00)	0.02 (1.00)	0.03 (0.19)	
Informal wage work	-0.11 (0.00)	0.15 (0.00)	0.10 (0.00)	0.14 (0.00)

Note: Results reported are mean differences in the percentage of households who reported that their living conditions had improved compared to 5 years ago. *P*-values are given in parentheses.

Source: Authors' calculations based on the 2016 VHLSS.

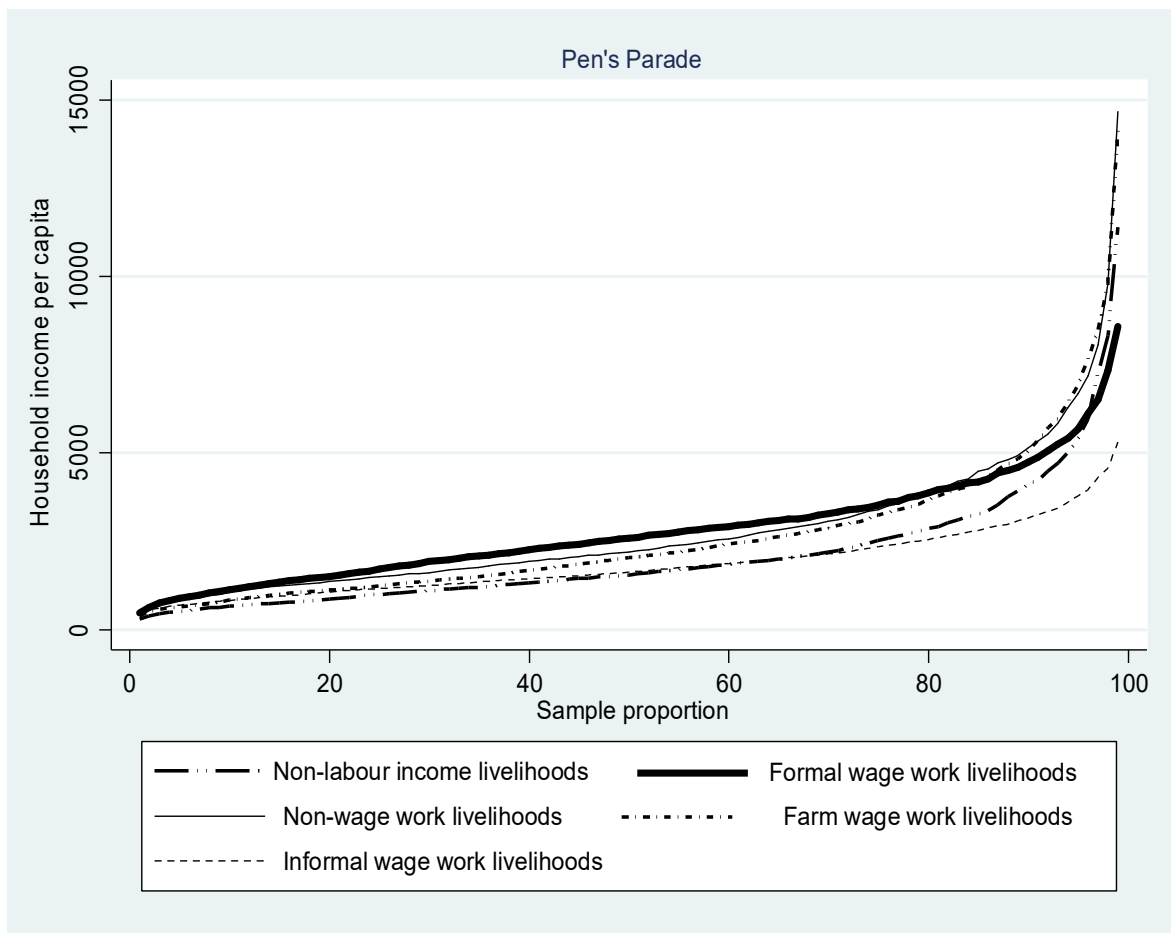


Figure 5: Pen's Parade comparing per capita income across livelihood strategies
 Source: Authors' calculations based on the 2016 VHLSS.

3.2. Econometric results

Table 5 reports the results from the MNL regression, in which the relative risk ratios (RRRs) show the effect of explanatory variables on the probability of livelihood choice compared to the probability of choosing an informal wage-earning livelihood. The results show that the larger the household, the more likely it is to specialize in informal wage-earning work as its main source of income. Also, households with a higher dependency ratio have a lower probability of choosing high-return livelihoods. Male-led households are less likely to pursue a formal wage-earning livelihood but are more likely to engage in farm work than their female-led counterparts.

Table 5

Factors Affecting the Choice of Household Livelihood in the Rural Mekong Delta Region (multinomial logit model)

Explanatory variables	Non-labor income	Formal wage-earning work	Non-wage-earning work	Farm work
Gender	0.93 (0.102)	0.74** (0.088)	0.93 (0.102)	1.58*** (0.169)
Age	1.07*** (0.027)	0.96 (0.045)	1.03* (0.019)	1.04* (0.023)
Age squared	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)	1.00 (0.000)
Education	1.05*** (0.016)	1.22*** (0.018)	1.15*** (0.014)	1.03** (0.014)
Ethnicity	0.91 (0.180)	1.01 (0.227)	1.12 (0.223)	1.30 (0.232)
Marital status	1.31 (0.385)	0.99 (0.285)	0.82 (0.215)	0.79 (0.224)
Dependency ratio	9.70*** (1.782)	0.79 (0.178)	2.04*** (0.378)	3.29*** (0.563)
Household size	0.55*** (0.023)	1.06* (0.034)	0.94** (0.028)	0.76*** (0.024)
Annual cropland (log)	1.30*** (0.038)	1.21*** (0.030)	1.06*** (0.025)	1.93*** (0.056)
Perennial cropland (log)	1.25*** (0.047)	1.18*** (0.042)	1.02 (0.035)	1.75*** (0.062)
Forestland (log)	1.28* (0.165)	1.22 (0.184)	1.18 (0.150)	1.26** (0.121)
Aquaculture land (log)	1.33*** (0.058)	1.16*** (0.048)	1.12** (0.051)	2.11*** (0.088)
Prone to natural disaster	1.24** (0.134)	1.18 (0.148)	1.09 (0.117)	0.97 (0.099)
Coastal area	0.94 (0.163)	0.61** (0.128)	0.95 (0.162)	1.21 (0.219)
Road access	0.97 (0.145)	1.27* (0.174)	1.37** (0.187)	0.79* (0.106)
Transport vehicles	1.24* (0.138)	1.02 (0.129)	1.17 (0.120)	0.99 (0.102)
Constant	0.93 (0.102)	0.74** (0.088)	0.93 (0.102)	1.58*** (0.169)
Observations	7,062	7,062	7,062	7,062
Wald chi2(68)	2497.48			
Pseudo R2	0.1857			

Note: Estimates are Relative Risk Ratios (RRRs) adjusted for sampling weights and clustered at the commune level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Informal wage-earning work livelihoods are the base or reference group. The area of all land types was divided by 100 and converted to the natural logarithm. The omitted categories in the dummy variable analyses are female sex, unmarried, ethnic minorities, no liability to natural disasters, inland delta area, no roads, no transport vehicles.

Source: Authors' calculations based on the VHLSS 2016.

We find that the level of education of household heads is positively associated with the choice of two profitable livelihood strategies. Specifically, Table 5 shows that given one

additional year in a household head's formal schooling, the relative probability of choosing a formal wage-earning livelihood increases by 22% and the relative probability of choosing a non-wage work livelihood increases by 15%. Similar results are found in several studies in rural Vietnam (Tran et al., 2018; Tran, Lim, Cameron, & Vu, 2014) and other developing countries (Rigg, 2006). For instance, Tran et al. (2014) found that education increases the likelihood of households seeking high-return livelihoods in Vietnam's peri-urban areas. The finding supports the argument made by Haggblade, Hazell, and Reardon (2010) that better education enables households to move out of low-return activities and the most profitable opportunities often require higher levels of education.

The coefficients (RRRs) on some types of land are greater than one and statistically highly significant, confirming that households with land holdings are more likely to specialize in high-return livelihoods (rather than informal wage-earning work). For example, all things being equal, a 10% increase in the size of annual cropland increases the likelihood of a household choosing farm work, formal wage-earning, or a non-wage work livelihood by 20%, 12% and 10%, respectively. Similar effects are apparent in the case of perennial cropland and aquaculture land.⁴

We also found that owning more forestland allows households to specialize in farming activities that are more profitable than pursuing an informal wage-earning livelihood. Our study provides the first evidence that the unavailability of land is a definite barrier to choosing remunerative livelihood strategies in the Mekong Delta region. This conclusion is not in line with findings for Vietnam's peri-urban areas (Tran, Lim, Cameron, & Vu, 2014) and Northwest region (Tran et al., 2018), where it has been discovered that owning more land increases the likelihood of households adopting a farm work livelihood which offers lower returns than other non-farm livelihoods. However, one of our findings accords with that in a study by Nguyen and Tran (2018) in the North Central region. They found that forestland played a major role in improving household income.

With respect to the role of commune-related factors in the choice of household livelihoods, holding all other variables constant, we find that in communes that are accessible

⁴ Given a 10% increase in the size of annual cropland, the corresponding difference in logarithm for the size of annual cropland is $\log(1.01) = 0.09531$, and the relative likelihood of choosing a farm work rather than informal wage work livelihood can be expressed in terms of the exponential function, $\exp(1.93 * 0.09531) \approx 1.20$. The corresponding relative likelihood of choosing formal wage work and non-wage work livelihoods (rather than informal wage work) is 1.12 and 1.10, respectively.

by road, households are more likely to pursue high-return livelihoods. For example, the relative probability ratio of choosing a formal wage-earning livelihood (compared to an informal wage-earning livelihood) is 1.27 times higher for those living in communes accessible by road. The relative probability ratio of adopting a non-laboring livelihood (compared to informal wage work) is 1.24 times higher for those living in communes where there are transport vehicles. A similar effect is found for those living in communes which have experienced at least one natural disaster in the past year.

4. Conclusion and policy implications

The extensive empirical literature estimating the contribution of land to household welfare disregards the question whether landholding is in fact a potential obstacle to choosing profitable livelihood strategies in the rural Mekong Delta region in Vietnam, a fertile region favorable to agriculture. We used cluster methods to identify what livelihood strategies are pursued by local households. Five livelihood strategies were classified at the household level. More importantly, we measure which livelihood strategies offer higher return in terms of household income per capita. It appears that the high-return group includes livelihoods based on formal wage work, non-wage work, or farm work livelihoods, while the low-return group consists of those who rely on non-labor income or informal wage income sources.

Our study shows a positive link between land holdings (e.g., annual, perennial croplands) and the choice of high-return livelihoods. In particular, we find that households owning less cropland and aquaculture land are more likely to adopt an informal wage work livelihood, which offers much lower income than farm work and other non-farm livelihoods. Thus, we provide the first econometric evidence that landlessness or land shortage is actually a potential barrier barring households from choosing remunerative strategies in the rural Mekong delta region. Overall, our finding implies that land-limited households may be pushed into low-return activities to compensate for the adverse context of land scarcity. The finding contrasts with that for Vietnam's peri-urban areas (Tran et al., 2014), where households can attain higher income by moving from farming to informal wage-earning work.

Fortunately, our research finding confirms that households with better education are more likely to engage in profitable non-farm livelihoods, such as formal wage-earning work or non-wage work. This finding implies that land is not the sole factor determining the choice of remunerative livelihood strategies and its role may be replaced by other factors, such as education and skills. Since land is in limited supply, a land distribution policy should not be

considered the main approach to improving household welfare in rural Vietnam. Instead, government investment in education should constitute a central, high priority measure for improving the living standards of the rural population.

The current study also finds that certain commune characteristics play an important role in enabling the pursuit of profitable livelihoods in the study area. A commune accessible by road increases the likelihood that households living in that commune will choose formal wage-earning work or non-wage work livelihoods. A policy implication here is that by improving local infrastructure (e.g., road access to communes), local governments can create a favourable context for local households to specialize or develop high-return activities for their livelihoods.

Conflict of Interest: The authors declare that they have no conflict of interest

References

- Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: methods and applications*. New York, USA: Cambridge university press.
- Chi, T. H. A. (2018). *Livelihood Pathways of Indigenous People in Vietnam's Central Highlands: Exploring Land-Use Change*: Springer.
- Finan, F., Sadoulet, E., & De Janvry, A. (2005). Measuring the poverty reduction potential of land in rural Mexico. *Journal of Development Economics*, 77(1), 27-51.
- Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: Prospects for growth and poverty reduction. *World Development*, 38(10), 1429-1441.
- Halpin, B. (2016). DUDAHART: Stata module to calculate and graph Duda-Hart cluster stopping indices from distance matrix, Statistical Software Components S458195. Boston: Boston College Department of Economics.
- Jansen, H. G., Pender, J., Damon, A., Wielemaker, W., & Schipper, R. (2006). Policies for sustainable development in the hillside areas of Honduras: A quantitative livelihoods approach. *Agricultural economics*, 34(2), 141-153.
- Lipton, M. (1985). *Land assets and rural poverty*. World Bank Staff Working Papers Number 744. The World Bank. Washington DC.
- Nguyen, C. V., & Tran, A. N. (2013). The role of crop land during economic development: evidence from rural Vietnam. *European Review of Agricultural Economics*, 41(4), 561-582.
- Nguyen, T. V., & Tran, T. Q. (2018). Forestland and rural household livelihoods in the North Central region, Vietnam. *Land Use Policy*.
- Nielsen, Ø. J., Rayamajhi, S., Uberhuaga, P., Meilby, H., & Smith-Hall, C. (2013). Quantifying rural livelihood strategies in developing countries using an activity choice approach. *Agricultural economics*, 44(1), 57-71.
- Punj, G., & Stewart, D. W. (1983). Cluster analysis in marketing research: Review and suggestions for application. *Journal of marketing research*, 20(2), 134-148.
- Ravallion, M., & Van de Walle, D. (2008). Does rising landlessness signal success or failure for Vietnam's agrarian transition? *Journal of Development Economics*, 87(2), 191-209.
- Rigg, J. (2006). Land, farming, livelihoods, and poverty: rethinking the links in the rural South. *World Development*, 34(1), 180-202.
- Serneels, S., Herrero, M., BurnSilver, S., Chenevix, P., Trench, Cochrane, K., . . . Said, M. Y. (2009). Methods in the Analysis of Maasai Livelihoods. In K. Homewood, P. C. Trench, & P. Kristjanson (Eds.), *Staying Maasai? Pastoral livelihoods, diversification and the role of wildlife in development* (pp. 369-408): Springer.
- Tran, T. A., Tran, T. Q., Tran, N. T., & Nguyen, H. T. (2018). The role of education in the livelihood of households in the Northwest region, Vietnam. *Educational Research for Policy and Practice*, 1-15. doi:DOI: 10.1007/s10671-018-9242-6
- Tran, T. Q. (2014). A review on the link between nonfarm employment, land and rural livelihoods in developing countries and Vietnam. *Ekonomski horizonti*, 16(2), 113-123.
- Tran, T. Q. (2015). Socio-Economic Determinants of Household Income among Ethnic Minorities in the North-West Mountains, Vietnam. *Croatian Economic Survey*, 17(1), 139-159.
- Tran, T. Q., Lim, S., Cameron, M., & Vu, H. V. (2014). Farmland loss, nonfarm diversification and inequality among households in Hanoi's peri-urban areas, Vietnam. *International development planning review*, 36(3), 357-379.

- Tran, T. Q., Lim, S., Cameron, M. P., & Van, H. V. (2014). Farmland loss and livelihood outcomes: A microeconometric analysis of household surveys in Vietnam. *Journal of the Asia Pacific Economy*, 19(3), 423-444.
- Tran, T. Q., Nguyen, S. H., Vu, H. V., & Nguyen, V. Q. (2015). A note on poverty among ethnic minorities in the Northwest region of Vietnam. *Post-communist economies*, 27(2), 268-281.
- Van den Berg, M. (2010). Household income strategies and natural disasters: Dynamic livelihoods in rural Nicaragua. *Ecological Economics*, 69(3), 592-602.
- WB. (2011). *Vietnam Development Report 2011: Natural Resources Management, Joint development partner report to the Vietnam Consultative Group Meeting, Hanoi, December 7–8, 2010*. Washington, DC: The World Bank.
- WB. (2016). *Transforming Vietnamese Agriculture: Gaining More for Less*. Hanoi, Vietnam: World Bank.