DETERMINANTS OF FARM HOUSEHOLD INCOME: A CASE STUDY FROM BAC KAN PROVINCE, NORTHERN VIETNAM

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Abstract

This study explores the impact of multiple factors on the overall income of farm households, employing the Ordinary Least Squares (OLS) methodology. It specifically assesses how different factors influence income levels and evaluates the importance of diverse income sources for rural livelihoods in the Northern Uplands of Bac Kan province, Vietnam. Data for this were derived from a survey encompassing 360 households in this rural region. Results suggest that farm households with more resources, better access to assets, and residing under favorable conditions with diverse income sources are likely to achieve higher income levels compared to others. Furthermore, the study posits that mitigating key barriers restricting access to land and financial resources, and bolstering the capacity for non-farm activities, could enhance income levels and contribute to poverty alleviation."

Keywords*: Factor, farm household, income, improve, multiple regression, livelihoods, Bac Kan.*
JEL classification: J, R2.

CÁC YẾU TỐ QUYẾT ĐỊNH THU NHẬP HỘ GIA ĐÌNH: NGHIÊN CỨU TRƯỜNG HỢP TỈNH BẮC KẠN, MIỀN BẮC VIỆT NAM

Abstract

Nghiên cứu này tìm hiểu tác động của nhiều yếu tố đến thu nhập chung của các hộ nông dân, sử dụng phương pháp Bình phương tối thiểu thông thường (OLS). Cụ thể, nghiên cứu đánh giá các yếu tố khác nhau ảnh hưởng như thế nào đến mức thu nhập và đánh giá tầm quan trọng của các nguồn thu nhập đa dạng đối với sinh kế nông thôn ở vùng núi phía Bắc tỉnh Bắc Kạn, Việt Nam. Dữ liệu được lấy từ một cuộc khảo sát 360 hộ gia đình ở vùng nông thôn này. Kết quả cho thấy các hộ nông dân có nhiều nguồn lực hơn, khả năng tiếp cận tài sản tốt hơn và sống trong điều kiện thuận lợi với nguồn thu nhập đa dạng có khả năng đạt được mức thu nhập cao hơn so với các hộ khác. Hơn nữa, nghiên cứu chỉ ra rằng việc giảm thiểu các rào cản chính hạn chế khả năng tiếp cận đất đai và nguồn tài chính, đồng thời tăng cường năng lực cho các hoạt động phi nông nghiệp, có thể nâng cao mức thu nhập và góp phần xóa đói giảm nghèo.

Keywords*: Nhân tố, hộ nông dân, thu nhập, cải thiện, hồi quy bội, sinh kế, Bắc Kạn.*

1. Introduction

Bac Kan, a province situated in the northern mountainous region of Vietnam, has agriculture as its predominant economic sector, contributing approximately 53% to the total production value. The service sector follows, accounting for about 33%, while the industrial sector contributes roughly 14%. Recent years have witnessed significant increases in household income, largely attributed to poverty alleviation programs, infrastructure improvements, and enhanced educational facilities, all of which have been instrumental in driving economic development. Despite these advancements, projections for 2022 indicate that Bac Kan's per capita income will reach only 26.3 million VND annually, a figure that remains below the average per capita incomes for both the northern mountainous region and Vietnam as a whole, as reported by the Bac Kan Provincial People's Committee (2022). This disparity highlights the ongoing economic challenges faced by the province in matching the broader regional and national economic growth rates.

Numerous prior studies have investigated how socio-economic factors such as landholding size, household size, rural credit, education level, and the age of the household head affect the income of farm households. However, notable exceptions exist in this area of research (Nghi and Trinh, 2011; Xuan and Nam, 2011; Loan and Huong, 2015; Hai, 2017). These studies have identified unique variables that influence agricultural household incomes, highlighting gaps in previous research which often overlooked various socio-economic aspects. It is critical to recognize that socio-economic variables can vary geographically,

potentially leading to spatially dependent correlations. This study marks the first of its kind in Bac Kan province, aiming to assess the impact of socio-economic characteristics on farmers' income. Our scope extends beyond the traditional focus on earnings from farming and breeding, incorporating additional sources of income generation for farm households. This broader approach opens up opportunities to explore new sets of factors affecting farm household incomes in the research area. Our findings will contribute to developing strategies to improve income and stabilize the livelihoods of rural households in Bac Kan province. Furthermore, the insights gained from this study will provide a scientific basis for government institutions and policy-makers to develop policies that enhance farmers' income and ensure consistent social security for rural households in Bac Kan province and, potentially, throughout Vietnam.

Furthermore, this research was carried out in a novel context where the Covid-19 pandemic had inflicted severe repercussions on the country's overall economy, with the agricultural sector being particularly hard-hit. In a High-Frequency Telephone Survey conducted by the World Bank involving 6,000 Vietnamese households, findings revealed the extensive economic impact of the Covid-19 pandemic. Approximately 70% of these households reported a decrease in income. The predominant reasons for this decline were job losses, followed by reduced income from household businesses and disruptions in agricultural production. Notably, the survey, as cited by the General Statistics Office (GSO) in 2022, highlighted a gender-specific impact: women were more likely than men to reduce their working hours or cease working entirely, particularly during school closures, to care for children.

2. Methodologies

2.1. Data collection

The selection of sample houses for the surveys employed a three-stage process, adhering to the methodology described by Hardeweg et al. (2013). This methodology was developed based on the recommendations put out by the United Nations Department of Economic and Social Affairs (United Nations, 2008). The first stage of the process entails the identification of sampled districts within each province. For the purpose of this study, two districts within Bac Kan province were chosen due to their distinct land use patterns and the presence of full official data for all districts.

Table 1: *Village selection and number of sampling*

District	Communes	Villages	No. of households selected
Ba Be	Khang Ninh	Na Lang	55
	Yen Duong	Na Vien	61
	Dia Linh	CocPai	59
	Quang Phong	Na Buoc	65
Na Ri	Lam Son	Pan Khe	57
	Kim Lu	Dong Tam	61
Total			**360**

Source: Calculated by author, 2022

During the second stage, a selection was made of six communes, with an equal representation of three communes from each of the two districts. The aforementioned communes encompassed Khang Ninh, Yen Duong, and Dia Linh within the Ba Be district, as well as Quang Phong, Lam Son, and Kim Lu within the Na Ri district. In the third stage of the study, the sampling of households was conducted by utilizing a full record of all houses. This record was obtained from the leaders of each commune. Following this, one village was selected from each commune, and a total of 65 households were randomly selected from each village. However, after discarding the questionnaires that failed to meet the established standards, only 360 responses remained. Table 1 presents the names of the communes and villages, along with the respective quantities of homes chosen for the purpose of sampling.

2.2. Data analysis

The income numbers presented are based on net income, which is determined by deducting all acquired inputs, such as hired labor, from the gross value. Nevertheless, it fails to consider household chores and responsibilities. The calculation of per capita income involved dividing the aggregate money obtained from a specific source by the number of individuals residing in a family, without taking into account factors such as age or other pertinent characteristics. The analysis was conducted on a sample of 360 households that satisfactorily completed all surveys, excluding thirty questionnaires that included mistakes. The data that was gathered underwent analysis utilizing descriptive statistics and the econometric analysis methodology. The data analysis was performed utilizing Microsoft Excel 2010 and STATA version 14.

The data acquired in this study was subjected to analysis using the Ordinary Least Squares (OLS) technique to evaluate the influence of different variables on household income. The aim of this study is to determine if a collection of variables collectively function as predictors for a designated dependent variable (Babbie, 2011). The multiple regression models in this inquiry were based on the assumption of the following equation, taking into account the presence of 10 independent variables.

$$Y = \beta_0 + \beta_1.X_1 + \beta_2.X_2 + \beta_3.X_3 + \beta_4.X_4 + \beta_5.X_5 + \beta_6.X_6 + \beta_7.X_7 + \beta_8.X_8 + \beta_9.X_9 + \beta_{10}.X_{10} + \varepsilon \quad (1)$$ Or

$$\text{Household income (HINCOME)} = \beta_0 + \beta_1.AGE + \beta_2.GENDER + \beta_3.EDU + \beta_4.LSIZE + \beta_5.HSIZE + \beta_6.DISTAN + \beta_7.OFFWORK + \beta_8.LSECUR + \beta_9.EXTEN + \beta_{10}.LOAN + \varepsilon \quad (2)$$

Where the variables are defined in Table 2:

Table 2: *Explanatory variables in multiple regression models*

Variables	Definition	Source references
AGE	Age of the household head in years (Years)	Nghi and Trinh (2011); Nem Nei Lhing et al (2013).
GENDER	Dummy, Gender of the households head (GENDER =1 if male and =0 if female)	Nem Nei Lhing et al (2013); Yakubu et al (2015); Loan and Huong (2015); Teame and Woldu (2016).
EDU	Number of years of schooling by the households head (Years)	Safa (2005); Nghi and Trinh (2011); Nem Nei Lhing et al (2013); Wanjiku (2017).
LSIZE	The land area of households (hectares)	Minh, (1997); Safa (2005); Dhakal et al, (2008); Bliss and Zeleke, (2010); Nem Nei Lhing et al (2013).
HSIZE	Number of individual members in a household	Davis et al (1983); Minh (1997); Safa (2005); Nghi and Trinh (2011); Banda (2012); Sekhampu and Niyimbanira (2013); Thai (2014); Hassan (2015); Ojoko and Umbugadu (2016); Rahman (2017); Wanjiku (2017).
DISTANCE	Distance from the household's house to a market center (kilometers).	Hassan (2015); Teame and Woldu (2016); Wanjiku (2017).
OFFWORK	Dummy, equals 1 if the household has a member participating in off-farm work and 0 otherwise.	Minh 1997); Teame and Woldu (2016); Wanjiku (2017); Hai (2017).
LSECUR	Dummy, LSECUR= 1 if secure and = 0 if otherwise	Nghi and Trinh (2011); Thai (2014); Loan and Huong (2015); Wanjiku (2017).
EXTEN	The number of days per year in which agricultural extension workers visit the household (Days)	Nghi and Trinh (2011); Loan and Huong (2015); Wanjiku (2017).
LOAN	Dummy, LOAN = 1 if households got any loans and =0 if otherwise	Nu, (2010); Thanh, (2011); Xuan and Nam, (2011); Banda, (2012); Teame and Woldu (2016); Hai, (2017).
HHINCOME	Total household income in a year by VNĐ	Nghi and Trinh (2011); Nem Nei Lhing et al (2013); Yakubu et al (2015).

3. Results and discussion

3.1. Characteristics of farm households

This study conducts a thorough descriptive analysis of household income within a specific research location, utilizing data compiled by the author in 2022. Table 4 showed that households are categorized into distinct income strata, each characterized by mean income, mean income per capita, and standard deviations. In the category of poor households, the mean household income is 48.66 Million VNĐ, with a mean household income per capita of 11.09 Million VNĐ. Near-poor households exhibit a higher mean household income of 80.01 Million VNĐ and a mean household income per capita of 21.73 Million VNĐ. Medium-income households display a mean household income of 99.52 Million VNĐ and a mean household income per capita of 30.64 Million VNĐ. High-income households, on the other hand, are characterized by a substantially higher mean household income of 189.51 Million VNĐ and a mean household income per capita of 59.39 Million VNĐ. The standard deviations in household income and household income per capita for each category indicate varying degrees of income diversity and dispersion. The overall mean household income for all categories is calculated at 82.41 Million VNĐ, with a mean household income per capita of 22.95 Million VNĐ. Comprehensive standard deviations of 68.23 Million VNĐ in household income and 19.28 Million VNĐ in household income per capita provide a macro-level perspective on the distribution and dispersion of income levels across all households. In conclusion, this descriptive analysis reveals economic heterogeneity within the research location, highlighting disparities in household incomes across different strata and contributing to a nuanced understanding of the economic dynamics within the studied community. Future research may delve deeper into causal factors influencing income distribution and explore policy implications to address observed disparities.

In addition to the variable 'HH income,' the author utilizes HH income per capita to categorize households based on income. Consequently, rural households are classified into four groups according to per capita income.

Table 3: *Household income in research location*

	Indicators	**HH income (Millions VND)**	**HH income per capita (Millions VND)**
Poor households	*Mean*	48.66	11.09
	Std. Deviation	20.38	3.79
Near-poor households	*Mean*	80.01	21.73
	Std. Deviation	26.17	2.49
Medium-income households	*Mean*	99.52	30.64
	Std. Deviation	34.56	2.70
High-income households	*Mean*	189.51	59.39
	Std. Deviation	118.52	26.73
Total	*Mean*	82.41	22.95
	Std. Deviation	68.23	19.28

Source: Calculated by author, 2022

Table 4 presents the socio-economic characteristics of households, classified into various categories. Regarding gender distribution among household heads, 79.72% of the sampled farm households are male-led, while 20.28% are female-led. Additionally, a significant proportion of households in our sample have a low level of schooling. Of the 360 surveyed households, only six heads possess university degrees, accounting for just 1.66% of the total. Furthermore, 28.06% of household heads have a high school education, and 70.28% completed primary and secondary education. Notably, among high-income households, only 38.33% of heads have a high school education, compared to 15.09% and 22% in near-poor and poor households, respectively.

The data also reveals disparities in proximity to markets. Only 22.22% of high-

income families live more than 3 kilometers from the nearest market, compared to 74% of poor households. Proximity to markets and major roadways gives affluent households a distinct advantage in agricultural product consumption, reducing transportation costs and providing opportunities for non-agricultural income sources, like entrepreneurial endeavors.

Additionally, the findings indicate differing rates of off-farm work participation across income levels. High-income households have a 31.11% participation rate in off-farm activities, followed by 36.36% for medium-income, 24.53% for near-poor, and 22% for poor households.

Table 4: *Characteristics of farm households by variables*

Indicator	Poor households (n=50)		Near-poor households (n=53)		Medium-income households (n=77)		High-income households (n=180)		Total (n=360)	
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*No*	*%*
Gender of households head										
1. Male	42	84.00	48	90.57	62	80.52	135	75.00	287	79.72
2. Female	8	16.00	5	9.43	15	19.48	45	25.00	73	20.28
Education of households head										
1. Primary school	22	44.00	22	41.51	26	33.77	37	20.56	107	29.72
2. Secondary school	17	34.00	23	43.40	32	41.56	74	41.11	146	40.56
3. High school	11	22.00	8	15.09	18	23.38	64	35.56	101	28.06
4. Undergraduate	0	0.00	0	0.00	1	1.31	5	2.77	6	1.66
Off-farm work										
1. Member of households have off-farm job	11	22.00	13	24.53	28	36.36	56	31.11	108	30.00
1. Member of households have not off-farm job	39	78.00	40	75.47	49	63.64	124	68.89	252	70.00
Land security of households										
1. Have certificate	42	84.00	41	77.36	47	61.04	154	85.56	284	78.89
2. Have not certificate	8	16.00	12	22.64	30	38.96	26	14.44	76	21.11
Distance										
1. Less than 1 km	0	0.00	0	0.00	1	1.30	21	11.67	22	6.11
2. From 1 to 3 km	13	26.00	18	33.96	38	49.35	119	66.11	188	52.22
3. More than 3 km	37	74.00	35	66.04	38	49.35	40	22.22	150	41.67
Loan size of households										
1. Households participant rural credit activities	3	6.00	24	45.28	65	84.42	169	93.89	261	72.50
1. Households do not participant rural credit activities	47	94.00	29	54.72	12	15.58	11	6.11	99	27.50

Source: Calculated by author, 2022

Moreover, the scale of capital plays a vital role in allowing farmers to expand their cultivation and more effectively use resources such as labor and land. The data in Table 4 show that a significant majority of low-income households, about 94%, do not participate in loan activities with the Bank. In contrast, a substantial proportion of high-income households, approximately 93.89%, are actively involved in borrowing activities

3.2. Factors effect on farm household's income

The OLS regression analysis results, detailing the factors affecting farm household income, are presented in Table 5. The R^2 value of 0.6065 indicates that 60.65% of the variation in household income is explained by these independent variables, while the remaining 39.35% is attributed to other factors. This high R^2 value suggests that the model is correctly specified, with the regression results aligning with theoretical expectations and the regression coefficients being statistically significant.

Furthermore, Table 5 reveals a significant F-test value (<0.01), confirming the reliability of the regression model at a 99% confidence level. The variance inflation factors (VIF) are less than 2, indicating no multicollinearity in the model. Additionally, the Durbin-Watson coefficient ($1 < d = 1.862 < 3$) suggests the absence of autocorrelation in the model.

The regression analysis highlights that certain demographic characteristics of household heads, such as age (AGE) and education (EDU), and household characteristics like land security (LSECUR) and frequency of visits by agricultural extension workers (EXTEN), do not significantly influence farm household income. In contrast, factors such as the gender of the household head (GENDER), size of landholdings (LSIZE), number of household members (HSIZE), off-farm work status (OFFWORK), distance from the household to the road or market center (DISTANCE), and farm household loans (LOAN) show a positive correlation with farm household income.

Table 5: *Factors affecting on farm household's income*

Variables	Estimated coefficients	Standard errors	t-statistic	P>[t]	VIF
Age (years)^{NS}	-0.16	0.21	-0.79	0.430	1.11
Gender (Male/female)*	-9.87	5.66	-1.74	0.082	1.05
Education (years)^{NS}	0.47	0.79	-0.59	0.553	1.09
Households size (persons)***	5.59	2.11	2.64	0.009	1.23
Land area size (Hectare)***	16.50	3.45	4.79	0.000	1.22
Off-farm work (Yes/No)***	14.83	4.99	2.97	0.003	1.15
Land security (Yes/No)^{NS}	4.51	5.23	0.86	0.388	1.11
Extension (days/year)^{NS}	-0.58	0.95	-0.61	0.543	1.12
Loan (Yes/No)***	26.12	4.51	5.80	0.000	1.29
Distance (km)***	-7.53	1.09	-6.88	0.000	1.27
Constant	35.16	16.93	2.08	0.039	-

n =360; R^2 = 0.6175; Adj. R^2 = 0.6065; F = 24.99; Prob> F = 0.0000; Durbin-Watson = 1.62
*P<0.1; ** P<0.05; *** P<0.01; ^{NS} No significant statistical

Source: Calculated by author, 2022

Our study reveals that the gender of the household head (GENDER) is a significant factor. The regression coefficient for this variable shows a notable negative correlation with household

income, estimated at -9.87. This indicates that households headed by females have an average income that is 9.87 million VND higher than those headed by males, a finding that contrasts with Nem Nei Lhing et al.'s 2013 study in Myanmar.

There is a significant positive correlation between household income and land ownership (LSIZE) ($P < 0.01$). A regression coefficient of 16.5 suggests that each additional hectare of land owned by a farm household increases their income by approximately 16.5 million VND annually. This aligns with previous studies indicating that income rises with increased land size, as it allows for expansion of agricultural activities or renting out land (Hai, 2017; Hogarth et al., 2013; Addis et al., 2016).

Labor force size (HSIZE) is another important factor. Our findings show that each additional household member increases income by about 5.59 million VND per year, suggesting that larger households are more productive and have greater opportunities to diversify jobs and income sources (Hassan, 2015; Loan and Huong, 2015; Nghi et al., 2011).

The study also explores income diversification through off-farm activities (OFF-WORK). Households engaging in non-agricultural self-employment earn an additional 14.83 million VND compared to those without such activities.

Distance to market centers (DISTAN) significantly impacts income, with each kilometer increasing transportation costs and decreasing market access, thereby reducing income by 7.53 million VND annually (Hassan, 2015).

Participation in rural credit programs (LOAN) also shows a positive correlation with income. Households with access to credit have higher incomes by 26.12 million VND compared to those without access (Xuan and Nam, 2011; Loan and Huong, 2015; Hai, 2017). This suggests that access to finance is crucial for enhancing household resources and engaging in productive activities (Sikor and Baggio, 2014).

4. Conclusions and Recommendations

The study's findings suggest that farm households with greater access to assets and resources, and those in favorable circumstances with diverse income sources, are likely to have higher incomes. Consequently, policy recommendations should focus on diversifying economic activities and promoting rural development to enhance income levels and reduce rural poverty. Key to this is improving households' access to resources and their capacity to engage in non-farm activities.

Our survey indicates that increased land access significantly benefits low-income households' income and livelihoods. Considering the disparities in asset access leading to income differences, poverty alleviation strategies should emphasize improving land and resource access for impoverished households. Aligning with egalitarian principles, ensuring equitable distribution of forest and cropland is critical. Addressing disparities in asset access, such as land and resources, is crucial for poverty alleviation. These policies include land reform initiatives that redistribute land to marginalized communities, resource access programs that empower impoverished households, and microfinance and credit programs that enable investments in assets. Social safety nets, like cash transfer programs, offer additional support, while effective land use planning and zoning regulations promote equitable land distribution. Data science plays a pivotal role in identifying areas with the greatest need, targeting beneficiaries, and assessing the impact of these policies. Moreover, education and capacity-building programs empower communities to make the most of their assets. Monitoring and evaluation using data-driven approaches are essential for ensuring the effectiveness and sustainability of these poverty alleviation strategies.

Moreover, the study highlights the potential of off-farm activities to diversify household income. Policies should therefore encourage non-farm engagement, expand off-farm opportunities,

and improve basic pay rates. For instance, initiating entrepreneurship training programs can empower individuals to leverage and develop local strengths. Another key strategy involves enhancing the quality and commercialization of unique local products. Moreover, actively seeking investment from both domestic and international non-agricultural enterprises can be instrumental in boosting non-agricultural sources of income in the region. This necessitates incentivizing rural households to participate in diverse markets and enhancing their response to these opportunities.

The research also shows that involvement in credit programs boosts income from agricultural and non-agricultural self-employment by enabling farm households to enhance their assets and leverage financial opportunities. Governments should, therefore, prioritize improving rural credit accessibility, reducing interest burdens, and easing repayment conditions to facilitate engagement in both formal and informal credit programs.

Interestingly, the study finds no significant link between agricultural extension activities and farm household income, suggesting a need to enhance the effectiveness of these programs. Agricultural extension personnel should be better equipped to assist in home agriculture development and establish robust connections with local farmers. This could involve disseminating technical information, providing high-quality, soil-appropriate seedlings, and offering institutional support to ease market access for agricultural products. Such initiatives could significantly improve the profitability of farming households.

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