

ECONOMIC DETERMINANTS OF OVER-INDEBTEDNESS IN AGRICULTURAL HOUSEHOLDS: A ROI-ET PROVINCE, THAILAND CASE STUDY

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Abstract

This study investigates factors contributing to over-indebtedness in 416 agricultural households in Roi-et Province, Thailand, using heteroscedasticity-corrected weighted least squares regression. Key determinants include agricultural assets, health shocks, communication payments, agricultural production input, and natural shocks, all with significant coefficients. Increased agricultural assets, communication payments, and agricultural production input correlate with decreased over-indebtedness, highlighting their mitigating impact. Conversely, higher occurrences of health shocks and natural shocks are linked to increased over-indebtedness. Gender, age, educational level, family size, and farm size exhibit non-significant coefficients. The findings underscore the pivotal roles of agricultural assets, communication payments, and effective risk management in alleviating over-indebtedness, suggesting targeted interventions in these areas for enhancing financial stability in agricultural households.

Keywords: Over-Indebtedness; Agriculture; Households; Income; Shocks.

INTRODUCTION

The agricultural sector is a vital driver of economic growth and food security, serving as an economic stabilizer and income source, especially during financial downturns (Meyer, 2019; Rasyid, 2021). It plays a key role in both urban and rural development, enhancing production, employment, and household income (Benazzi et al., 2020). In rural areas, agriculture is crucial for local economies and food supplies, as seen in countries like Korea (Heo et al., 2018).

Agricultural households in low-income countries face challenges from climate change, financial vulnerabilities, and geographical disadvantages (Wilts et al., 2021; Barnes et al., 2020). Succession planning and improved education and financial practices can mitigate these challenges, fostering resilience (Ramprasad, 2018).

In Thailand's Roi-et province, despite industrialization and financial constraints, agriculture remains significant for livelihoods and the national GDP (Apipoonyanon et al., 2020; Uehara, 2019). Small-scale farmers prioritize life satisfaction over profit, navigating challenges of limited production (Nguyen et al., 2020).

The combination of Tropical Storm Podul and the COVID-19 pandemic intensified financial vulnerabilities in Roi Et, leading to increased debt-to-income ratios and economic distress (Roi Et Provincial Office of Agricultural Economics, 2023).

Chantarat et al. (2023) highlighted the critical state of Thai agricultural households with unsustainable debts, emphasizing the need for substantive solutions. The lack of research on variables like gender, age, education, and family size in Roi-et indicates a knowledge gap. This study aims to explore factors contributing to over-indebtedness, employing a quantitative methodology to inform policymakers and address this prevalent issue in the region.

LITERATURE REVIEWS

Over-indebtedness, marked by excessive household debt leading to economic strain, is a critical exploration area (D'Alessio & Iezzi, 2013; De Souza Delgado & Halik, 2017). The debt-to-income ratio, influenced by factors like wages and education, offers crucial insights. Gender influences economic vulnerabilities, especially in female-headed households globally (Ismail et al., 2018). Age and educational level significantly impact debt accrual and financial behaviors (Lewin-Epstein & Semyonov, 2016; Grimes et al., 2021). Family size affects over-indebtedness, with larger agricultural households facing increased financial limitations (Mkandawire & Xiao-Hong, 2016). Strategic interventions in family planning can mitigate over-indebtedness challenges globally.

Farm size significantly influences financial strategies in agriculture, with smaller farms often grappling with higher debt levels and relying on non-institutional credit sources (Bojnec & Fertó, 2023; Wolf et al., 2016; Kryszak et al., 2021). Modifying farm scale emerges as a viable strategy to mitigate over-indebtedness, emphasizing the need for tailored financial approaches. Livestock portfolios act as a buffer against environmental adversities, enabling households to adjust consumption levels and achieve financial stability (Acosta, Nicolli & Karfakis, 2021; Ngigi et al., 2015). Index-based livestock insurance enhances income and milk production during droughts, showcasing diverse strategies for financial resilience (Matsuda, Takahashi & Ikegami, 2019). Addressing resource disparities is crucial to alleviate over-indebtedness, particularly related to landholding distribution (Baria, 2021; Varkey, 2022; Bunsen et al., 2023; Balaji & Reddy, 2022).

Health shocks, such as severe health issues or prenatal exposure to adverse conditions, can lead to over-indebtedness by increasing health expenditures or reducing income (Chhay & Rahut, 2022; Conti et al., 2022). Caregivers of individuals with severe dementia face heightened financial strain, creating a cycle where shocks deepen vulnerabilities, resulting in chronic economic hardships (Malhotra et al., 2023). Natural shocks, particularly in developing countries, elevate over-indebtedness risks as rural households resort to increased borrowing to cope with health shocks, often leading to debt (Chhay & Rahut, 2022). Furthermore, natural disasters contribute to non-performing loans and public debt, impacting both household and national financial stability (Benali et al., 2018; Chen et al., 2022; Newman & Tarp, 2020).

Communication payments, especially those facilitating personal dialogues through phone calls from agents, significantly impact borrower behaviors by promoting timely repayments and reducing defaults (Muravskiy et al., 2023; Laudenbach & Siegel, 2018). Despite their positive influence, the potential for hidden actions and strategic defaults by borrowers underscores the importance of adopting a comprehensive approach to fully understand and address the role of

communication payments in over-indebtedness (Dechenaux & Mago, 2019; Kerr et al., 2017).

In conclusion, over-indebtedness, driven by excessive household debt causing economic strain, is influenced by factors like the debt-to-income ratio, gender disparities in female-headed households, and the impact of age and education on debt accrual. Family size, especially in larger agricultural households, contributes to challenges. Strategic family planning and tailored financial approaches can globally mitigate over-indebtedness. In agriculture, smaller farms face higher debt relying on non-institutional credit, while livestock portfolios and insurance enhance financial resilience. Health shocks and communication payments also play roles.

METHODOLOGY

The study focused on debt issues within 2,250 agricultural households in Roi Et province (Farmers' Debt Management Bureau, 2017), utilizing stratified random sampling across seven districts. A proportional allocation method resulted in a robust sample of 416 households, employing the formula of Yamane (1967) and representing approximately 18-19% from each district. Demographic details, education, agricultural variables, and communication payments were collected through a meticulously designed questionnaire, verified for reliability with an Indicator of Congruity (IOC) value exceeding 0.5. Ethical approval from the Human Research Ethics Committee (project code 2019/051, B1) ensured the study's ethical integrity. This comprehensive methodology, overseen by a panel of experts, facilitated credible insights into the multifaceted dimensions of agricultural debt dynamics.

Data collection involved obtaining cooperation from the Faculty of Social Sciences and Humanities in Thailand, securing permissions from agricultural departments, and scheduling appointments for empirical data collection through structured questionnaires. Over-indebtedness was identified as the dependent variable, measured by the annual debt-to-income ratio exceeding twice or more than 50%. Independent variables included gender, age, education, agricultural assets, health shocks, family size, farm size, communication payments, agricultural inputs, and national shocks. Weighted least squares regression was applied, standardizing independent variables, and data analysis utilized a social science analysis program.

Weighted least squares regression was employed to explore the factors distribtue to over-indebtedness. The model was specified as in equation (1):

$$\hat{Y} = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}) \quad (1)$$

The empirical model was defined according to equation (2).

$$\hat{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \epsilon_i \quad (2)$$

In the equation, \hat{Y} represents the annual debt of agricultural households with a debt burden equal to or exceeding twice their income or more than 50% of their income (BIS, 2010), β_1 denotes the coefficients, and ϵ_i represents the random error term. Weighted least squares regression was employed, with independent variables standardized by the variance of over-indebtedness. Data analysis was conducted using the social science analysis program.

RESEARCH RESULTS

Prior to model estimation, multicollinearity among socio-economic factors was assessed, revealing VIF values consistently below 2, indicating an absence of multicollinearity. Regression results and VIF outcomes are presented in Table 3, and a correlation matrix is in Appendix 1. To address heteroscedasticity, heteroscedastically corrected weighted least squares regression with robust standard errors was employed. Figure 1 shows the normality of residuals, indicating an independent, normally distributed pattern with a zero mean and constant variance.

Table 2: Showed Variable, Description, Measurement, Mean and Standard Deviation

Variable	Description	Measurement	Mean	Standard Deviation
Dependent variable Ŷ Over-indebtedness	Over-indebtedness	the annual debt of agricultural households with a debt burden equal to or exceeding twice their income or more than 50% of their income.	4.48	2.43
Independent Variables				
X ₁ Gender	Gender of Agricultural households leaders	Dummy; 1 Male, 0 otherwise	0.50	0.50
X ₂ Age	Age of Agricultural households leaders	Age in year	45.64	11.92
X ₃ Educational level	Educational level of households leaders	Dummy; 1 undergraduate or more, 0 otherwise	0.43	0.50
X ₄ Agricultural Assets	Total Agricultural assets only livestock such as cattle or pigs	Number	20,792.24	9,810.93
X ₅ Health shocks	Health problem of member in family	Dummy; 1 yes, 0 otherwise	.73	.45
X ₆ Family size	All members in agricultural households	Number	4.07	.82
X ₇ Farm size	Total land area held with ownership rights. 20.78 (Thai rais) is approximately equal to 0.08143 acres.	Number	20.78	6.15
X ₈ Communication payments	All payments of phone usage (Thai Baht)	Number	1,090.50	280.86
X ₉ Agricultural production input	Payments of chemical fertilizer for agricultural process per year	Number	11,291.44	5,375.88
X ₁₀ Natural shocks	Natural Impact (Flooding and drought) on agricultural households	Dummy; 1 yes, 0 otherwise	.55	.50

The model demonstrated a strong fit with an R^2 of 0.6957, indicating that 69.57% of over-indebtedness variation in agricultural households was influenced by independent variables. The F-statistic value of 92.60 ($p < .01$) confirmed the significant impact of these variables. Over-indebtedness was positively influenced by health shocks, natural shocks, and communication payments, while negatively affected by gender, age, education, family size, farm size, agricultural assets, and production input.

Table 3: Presents The Empirical Results of a Heteroscedastically Corrected Weighted Least Squares Regression, Incorporating Robust Standard Errors for Increased Accuracy

Variable	Coefficient	P	VIF
X ₁ Gender	-.1228719 (.1208623)	0.31	1.53
X ₂ Age	-.0061936 (.0050033)	0.216	1.5
X ₃ Educational level	-.0805993 (.1229579)	0.513	1.48
X ₄ Agricultural assets	-.0000469 (7.50e-06)	0.000**	1.03
X ₅ Health shocks	1.410427 (.1275008)	0.000**	1.4
X ₆ Family size	-.0448145 (.0755004)	0.553	1.11
X ₇ Farm size	.0183883 (.010037)	0.068	1.03
X ₈ Agricultural production input	.0001028 (.0000177)	0.000**	1.03
X ₉ Natural shocks	1.621004 (.1563437)	0.000**	1.02
X ₁₀ Communication payments	.0010613 (.000259)	0.000**	1.01
Constant	1.734998	0.005**	
Sum squared residuals	604.601	SE of regression	0.60984
R-squared	0.6957	Adjusted R-squared	0.6882
F (10, 405)	92.6	P-value (F)	0
Log-likelihood	-729.62	Akaike criterion	1479.23
Schwarz criterion	226.687	Hannan-Quinn	1495.21
Significance levels: **=p<.01			

Source: Field survey, 2017, Note: Figures in parentheses are standard errors

DISCUSSION AND CONCLUSION

The research findings indicate that agricultural assets, specifically livestock, have a significant impact on mitigating excessive debt, establishing a negative correlation. This implies that households engaged in agriculture, particularly those with a substantial number of livestock, serve as a financial buffer during times of hardship or scarcity. The results of this study align with previous research by Acosta et al. (2021), Ngigi et al. (2015), and Matsuda et al. (2019). It is observed that households with a significant livestock farm can use it as collateral during challenging times. In cases of asset shortage, these households can also sell livestock to alleviate financial difficulties. The study findings reveal a positive correlation between households with sick members and excessive indebtedness.

In other words, agricultural households with sick members face challenges in generating income as these members, especially if they are household heads and breadwinners, represent the financial hope of the household. Consequently, they are more likely to incur excessive debts compared to households without sick members.

This may be attributed to the fact that households with severely ill members are unable to self-support, requiring care from other household members. If these members are not in their prime working age, it reduces the income-generating opportunities for the household, leading to higher chances of indebtedness.

This aligns with previous research by Chhay & Rahut (2022), Conti et al. (2022), and Malhotra et al. (2023), which found that the severity of illness among household members contributes to income loss and an increased likelihood of excessive indebtedness to address financial challenges associated with healthcare.

The factors influencing agricultural production exhibit a positive correlation with the indebtedness behavior of agricultural households. Specifically, the prices of inputs for agricultural production, as highlighted in this study, particularly the costs associated with purchasing chemical fertilizers, play a crucial role. The research findings indicate that as agricultural households increase their use of chemical fertilizers to enhance agricultural productivity, there is a tendency for higher levels of excessive indebtedness. This is attributed to the fact that agricultural producers often experience income losses during the cultivation season due to the focused investment in their own farming areas, leading to a lack of income during this period.

The primary solution for financial challenges in such circumstances is resorting to agricultural credit from financial institutions, both within and outside the formal financial system. However, this borrowing strategy may come with risks, as the agricultural output may not be optimal or market prices may not be favorable, increasing the likelihood of excessive indebtedness. This study aligns with the findings of previous research by (Padmaja & Ali, 2019) that emphasized the heightened risk of excessive indebtedness for households with high agricultural expenditure.

This risk is associated with factors such as low market prices for agricultural produce, dangers from chemical inputs, and natural disasters adversely affecting agricultural operations. Rural households facing natural disasters, such as heavy flooding and drought, tend to over-indebtedness. Research indicates that impacted households, especially in regions like Roi Et province, heavily affected by frequent flooding from the Chi River, experience agricultural losses, compelling them to seek loans. However, reliance on institutional loans, including agricultural and state banks, presents challenges due to low confidence, pushing farmers to explore non-institutional loans with higher interest rates. To recover from disaster-induced agricultural losses, farmers must consider alternative risk mitigation strategies beyond relying solely on loans. This study aligns with the study results of Chhay & Rahut (2022).

They indicated that natural shocks are related to over-indebtedness and they emphasized the importance of establishing effective risk management mechanisms, as relying solely on loans to address natural disasters is not sustainable. The coefficient for Communication payments reveals a highly significant positive association with over-indebtedness in agricultural households, implying that increased communication payments are linked to higher indebtedness levels.

This aligns with literature highlighting the impact of communication payments, particularly personal dialogues facilitated by phone calls from agents, in encouraging timely repayments and lowering defaults (Muravskiy et al., 2023; Laudenbach & Siegel, 2018). Yet, hidden actions and strategic defaults by borrowers may undermine these strategies, emphasizing the need for

a comprehensive approach to understand and address the nuanced role of communication payments in managing agricultural households' indebtedness (Dechenaux & Mago, 2019; Kerr et al., 2017).

This dataset unveils crucial variables like gender, age, education level, and family and farm size as significant influencers of economic stability and financial actions, even though they do not exhibit a direct correlation with over-indebtedness in this specific model. Studies like those by Negesse et al., 2020, and Handa, 1994, elucidate the heightened economic vulnerabilities experienced by female-headed households, especially in countries like Ethiopia and Nigeria, which struggle with severe issues such as food scarcity and inadequate housing. Similarly, the age and educational attainment of the household leaders significantly impact financial management capabilities, thereby influencing trends in over-indebtedness as illustrated by works of Grimes et al., 2021, and Prabowo et al., 2018. Additionally, the dimensions of both family and farm are pivotal determinants of economic pressure, as depicted by research from Bojnec & Fertő, 2023, and Mkandawire & Xiao-Hong, 2016, emphasizing the need for refined strategies to navigate the intricate landscape of over-indebtedness. Consequently, these findings emphasize the necessity for holistic and diversified strategies to address the multifarious challenges engendered by over-indebtedness.

In conclusion, the regression model explores factors influencing agricultural household over-indebtedness. Key findings reveal a significant negative association with Agricultural assets, suggesting reduced over-indebtedness with increased agricultural holdings. Positive correlations are noted for Health shocks and Natural shocks, indicating elevated over-indebtedness with heightened shocks. Educational level, Family size, and Farm size exhibit non-significant associations. The model's overall significance ($F = 92.60$, $p < 0.0001$) and high R-squared (0.6957) underscore its explanatory power. Communication payments contribute positively to over-indebtedness. Recommendations include promoting agricultural asset accumulation, addressing health shocks, managing natural shocks, implementing financial literacy programs, and formulating policies for equitable resource distribution to mitigate over-indebtedness risks.

Appendix 1

	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀
Y	1										
X ₁	-0.075	1									
X ₂	-0.068	0.062	1								
X ₃	-0.010	0.044	-0.082	1							
X ₄	.414**	0.043	0.033	0.027	1						
X ₅	-.599**	0.079	-0.009	0.052	-.186**	1					
X ₆	-0.078	-0.021	-0.023	0.004	-0.040	0.021	1				
X ₇	0.041	-0.002	-0.016	0.052	0.043	0.078	0.061	1			
X ₈	.569**	-0.029	-0.005	0.018	.208**	-.428**	0.035	0.005	1		
X ₉	.694**	-0.024	-0.054	0.092	.262**	-.416**	-0.070	0.048	.494**	1	
X ₁₀	.507**	-0.082	0.017	-0.061	.133**	-.502**	-0.068	-0.087	.376**	.354**	1

** . Correlation is significant at the 0.01 level (2-tailed).

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