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DETERMINANTS OF LOAN REPAYMENT OF THE SHRIMP HOUSEHOLDS: AN EMPIRICAL STUDY IN CA MAU PROVINCE, VIETNAM

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ABSTRACT

The aim of this paper was to analyze the determinant factors of the ability of shrimp farmers to repay loans on time and the decisive factors of the on-time loan repayment amount. Based on the primary data of 210 shrimp farming households in Ca Mau province, the study applied a two-step regression model of Heckman to test the proposed hypotheses. The research results showed that the number of dependent members, loan amount and number of farming crops negatively impact the ability to repay the loan in a timely manner, while total assets, shrimp farming experience and loan purpose positively influence the ability to repay the loan on time of shrimp households.

In addition, the regression results also showed that number of loan maturity and size of shrimp farming land negatively affect the amount of on-time loan repayment, whereas the education level of the household head and total assets positively influence the on-time loan repayment amount. Based on the empirical findings, the authors proposed several recommendations for improving the loan repayment capacity of the households in the study area.

Keywords: loan repayment capacity, Formal credit, Shrimp household, Heckman two-step method, Vietnam

JEL Classification: C00, E51, G21, P46

INTRODUCTION

Ca Mau province is located in the southernmost of Vietnam and is surrounded by water on three sides with 254 km of coastline, has a fishing ground of over 100,000 km2, has many great and potential fishery resources. Ca Mau province is a key area of the country for aquaculture with 297,200 hectares of aquaculture area (Ca Mau Provincial Statistics Office, 2021). In general, Ca Mau has many potentials and strengths for socio-economic development, however, the poverty rate is still high, and there is a surplus of labor in rural areas. Thus, the income gap and life gap between rural and urban areas have increased. The reason may be due to lack of facilities, lack of applying science and technology in production, lack of capital, etc. Therefore, in order to improve income and life quality, local people must try to improve the efficiency of production, especially shrimp farming.

One of the essential factors to develop shrimp farming is capital. Farmers need to access credit effectively. However, people still face many difficulties when accessing formal credit and the use of loan is not effective. So, the problem is that farm households with limited equity do not have enough capital to ensure the production of shrimp farming, so most of the production mainly relies on formal and informal loans. However, informal loans often have high lending interest rates, so the use of this type of capital for production is not efficient. Therefore, it is necessary to propose practical solutions to help farmers access official capital from banks for production and farming in order to improve their income and lives. In fact, most farmers in Ca Mau province have not accessed bank loans to support their shrimp farming for many years as they are not able to repay previous loans, so these households lack the capital to invest in shrimp farming. Besides that, formal credit provided by commercial banks is also limited and does not meet the

production needs of farmers. A large number of farmers in Ca Mau provinces are the poor and the near-poor, so they cannot afford industrial shrimp farming and improve production methods.

In fact, shrimp farming households in Ca Mau province using loans face many risks such as poor weather conditions, diseases causing mass mortality of shrimp, using loans for improper purposes. These factors strongly affect the efficiency of credit use and the ability to repay loans on time. In order for farmers to access capital from official credit institutions, especially commercial banks, to serve their production needs, it is necessary to consider previous loans and the ability of shrimp farmers to repay debts on time to avoid overdue debt and bad debt. For formal credit institutions, that farmers pay off their debts on time is an important factor when considering providing new loans to these customers. Therefore, it is vital to analyze factors impacting the ability of shrimp farmers to repay loans on time in Ca Mau province, thereby providing several recommendations to improve the loan repayment capacity of the households in the study area.

LITERATURE REVIEW

1. Studies related to credit access and loan amount

For farmers in Ca Mau province, aquaculture production provides a significant source of income and can be seen as the main source of household income. Therefore, in order for farmers to improve their lives, aquaculture production must be developed. Aquaculture activities need more investment and support from guiding the application of science and technology in aquaculture to providing capital support to improve quality and increase output. For farming households, capital is a necessary factor to develop production to improve family life. Thus, farmers need to access credit from official financial institutions to have enough capital for production. However, most of the farmers have not used loans for productive purposes effectively because a large amount of the borrowing money is used to repay the previous loans of the farmers instead of investing in farming activities. In other words, the loan is used for the wrong purpose. At the same time, many farmers do not pay their debts on time, so they are classified as customers with bad credit history, which makes it difficult for them to access capital from official credit institutions.

Accessing formal and informal credit markets in rural areas is still limited not only in Vietnam but also in some other countries around the world. A number of previous studies have analyzed access to credit and the amount of loans of farm households. The research of Zeller (1994) examined the determinants of credit participation and credit rationing by informal lenders and by members of community-based groups that allocate formal group loans among themselves in rural areas in Madagascar. The author used the Probit model to estimate the factors affecting the application for credit by individual adult household members and to estimate the determinants of being credit-constrained. Research results showed that a number of personal characteristics and economic conditions affect households participating in credit, including age, working as a government employee, education level, and wage income. The results also indicated that formal lending institutions collect and use locally available information about the applicant's creditworthiness in much the same way as informal lenders do. Additionally, the findings pointed out that land is the standard of loan distribution, and it is equally important for informal lenders and formal credit institutions. Both informal lenders and formal group members rely on information about the wealth, indebtedness, and potential income of the loan applicants.

Previous studies have also shown that the untimely repayment of debts of some households to credit institutions frequently occurs in many areas and in many production fields. Specifically, the research conducted by Nguyen & Pham (2010) showed that the probability of using formal credit of farm households in suburban of Hanoi is influenced by age, the social position of the head of household, using informal credit, and borrowing procedures. Meanwhile, the education level of the household head, size of land area, household gross income, collateral and borrowing purpose are the decisive factors in the size of formal loans. The research results of Le & Nguyen (2012) pointed out that the amount of money borrowed from formal credit of shrimp farmers in Bac Lieu province depends on collateral, education level, social status, and the number of organizations where shrimp farmers can obtain loans. Another remarkable conclusion of this study is that shrimp farming involves many risks and the percentage of shrimp farming households having overdue debt is very high. Research results also showed that informal credit grows stronger than formal credit in the study area. The study by Phan (2013) claimed that land holding status, informal interest and informal loan duration are important factors influencing access to informal credit of rural households in the Mekong River Delta. Factors influencing formal credit accessibility include local government employee status, credit group membership, a poor certificate, education level, working skills and village road access. The study suggested that in order to reduce dependence on informal credit and to improve access to formal credit through microcredit programs, farmers need to actively participate in local credit groups. The research conducted by Tran & Huynh (2013) stressed that the probability of credit constraints of households in An Giang province is affected by many factors of household characteristics such as education, occupation, area of residential land, the value of assets and using

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trade credit. In addition, the size of formal loans is affected by social relations, borrowing purpose, the value of assets and income of households.

2. Studies related to the ability of farmers to repay debt

The access to credit of households is an issue that needs more attention and investigation in both formal and informal credit markets. However, after a farmer takes a loan, the way using the loan is another problem that needs to be considered, because the effective use of capital will make an important contribution to the ability of farmers to repay the debt on time. Therefore, in addition to a number of studies on the access to capital of farmers, studies on the use of capital and the ability of households to repay loans after borrowing are also carried out by many researchers. The research results of Kim (1978) showed that the factors of education level, age of the household head, and the number of dependents in the family affect the ability of farmers to repay loans on time in Korea. Research conducted by Oke et al. (2007) pointed out the factors that significantly influence the ability to repay microcredit loans of households in southwestern Nigeria, including income, the amount of business investment, the amount of loan borrowed, and the number of days between loan application and disbursement. The study of Afolabi (2010) also stressed that the factors of the loan amount, farm size, interest rate, and non-farm income impact the ability to repay loans of small-scale farmers in Oyo State, Nigeria. The findings of Yogendrarajah & Semasinghe (2015) showed that amount of loan, loan interest, decision-making at the household level, control over resources and loan management affect the microcredit loan repayment of women members of microfinance institutions in Northern Sri Lanka.

In Vietnam, the research conducted by Truong & Nguyen (2011) found that the ability of farmers to repay loans on time in Hau Giang province is positively correlated with income after borrowing and the number of family members who generate income. In addition, the research results showed that the higher the education level of the household head, the higher their ability to repay debt on time. This study also stressed that the ability to repay loans on time of households borrowing for agricultural production purpose is higher than that of households borrowing for non-agricultural purposes. The research conducted by Vuong (2015) analyzed the ability to repay debt of agricultural and non-agricultural households who accessed credit from banks in different forms (group loans and individual loans) in the Mekong Delta. The results showed that among borrowers, households who have engaged in agricultural production have a higher ability to repay loans on time than non-agricultural households. For group loans, the ability to repay debt is affected by factors such as education level, loans to agricultural production households, and loan amount. For personal loans, the loan amount, agricultural production households, and the borrower's gender influence the borrower's ability to repay loan.

Through the comprehensive review of prior studies related to the research topic, it is important to address that previous studies have found the factors affecting the ability to access loans and repay loans of farm households. However, few studies examine the factors impacting the amount of on-time loan repayment of households, especially no research has been conducted on the research subjects who are shrimp farmers in Ca Mau province. Therefore, this study analyzes the factors influencing the ability of shrimp farmers to repay loans on time based on the inheritance of related studies, and also analyzes the factors affecting the amount of on-time loan payment of shrimp farmers in Ca Mau province.

METHODS

1. *Data collection*

Primary data is collected by directly interviewing 210 shrimp farming households in Ca Mau province. The study uses the stratified random sampling method according to shrimp farming households who have formal loans for the period 2014 - 2016. Specifically, the districts selected for the survey include: Phu Tan district, Cai Nuoc district, and Nam Can district. In each district, the authors randomly select 3 communes, then in each commune, the authors randomly select a number of shrimp farming households who have formal loans to interview through a prepared questionnaire. The primary data of the study includes the following information: (i) Characteristics of the household head, general information about the household and shrimp farming situation of the household, (ii) Status of formal credit and loan repayments of shrimp farmers in Ca Mau province.

This study also collects secondary data from the People's Committee of Ca Mau Province, the Department of Agriculture and Rural Development of Ca Mau Province, the State Bank of Vietnam - Ca Mau Branch, the Ca Mau Bank for Social Policies, the Statistics Department of Ca Mau Province, information from books, newspapers, and magazines related to the topic.

Table 1. Sample selection structure.

Study area	Number of households	Proportion (%)
Phu Tan district	72	34.29
Tan Hai commune	24	11.43
Phu Tan commune	24	11.43
Phu Thuan commune	24	11.43
Cai Nuoc district	69	32.86
Luong The Tran commune	23	10.95
Hung My commune	23	10.95
Hoa My commune	23	10.95
Nam Can district	69	32.86
Tam Giang commune	23	10.95
Tam Giang Dong commune	23	10.95
Lam Hai commune	23	10.95
Total	**210**	**100.00**

2. *Estimation Method*

The study applies the two-step regression model of Heckman (1979) to estimate the factors affecting the ability to repay loans on time of shrimp farmers in Ca Mau province and the factors influencing the on-time loan repayment amount of these households. The two-step Heckman regression method allows the use of information from delinquent households to improve the estimate of the parameters in the regression model (Gujarati, 1995). In this study, the Heckman regression model explains why some shrimp farmers pay their loans on time, while others fail to repay their loans on time. Simultaneously, the model results also explain why some households pay on time with a large amount of repayment, and some households pay on time with less amount. Besides that, the model shows the parameters to check the fit of the model and the degree of the impact of the independent variables on the dependent variable.

The first step in the regression model of Heckman (1979) is to use a probability model to estimate the value of the dependent variable based on the ability of shrimp farmers to repay a debt on time or not. Based on a theoretical basis and empirical studies, the authors propose a model to estimate the factors affecting the ability to repay loans on time of shrimp farmers in Ca Mau province as follows:

$$ABILITY = \alpha + \beta 1GENDER + \beta 2EDU + \beta 3EXP + \beta 4ASSET + \beta 5INCOME + \beta 6DEP + \beta 7AMOUNT + \beta 8INTEREST + \beta 9TERM + \beta 10PURPOSE + \beta 11CROP + \beta 12FORM + \beta 13ROS \quad (1)$$

Table 2 summarizes the characteristics of the variables in Probit regression model and the expected signs of the impact of the independent variables on the ability of shrimp farmers to repay a debt on time.

Table 2. Summary of the variables in Probit regression model.

Variable	Measurement Method	Unit	Expected Sign
Ability of shrimp farmer to repay loans on time (ABILITY)	Dummy variable, 1 = Pay off the loan on time, 0 = Otherwise	Dummy	
Gender of household head (GENDER)	Dummy variable, 1 = Male, 0 = Female	Dummy	(+)
Education level of household head (EDU)	Number of schooling years	Year	(+)
Shrimp farming experience (EXP)	Number of years of experience with shrimp farming	Year	(+)
Total asset (ASSET)	Total asset value of the household	Million VND	(+)
Income (INCOME)	Annual income of shrimp household	Million VND/Year	(+)
Dependent member (DEP)	Number of dependent members who are under 15 or over 60 years old in the household	Person	(-)
Loan amount (AMOUNT)	Amount of loans of the household	Million VND	(+)/(-)
Lending interest rate (INTEREST)	Interest rate of a bank loan	%/Year	(-)
Loan Term (TERM)	Amount of time that a borrower is given to pay off a loan	Year	(+)
Loan purpose (PURPOSE)	Dummy variable, 1 = Use the loan for the right purpose (shrimp farming), 0 = Otherwise	Dummy	(+)
Farming crop (CROP)	Number of farming crops per year of the household	Crop/Year	(+)
Form of shrimp farming (FORM)	Dummy variable, 1 = Industrial farming, 0 = Otherwise	Dummy	(+)

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Return on sales (ROS)	Amount of profit compared to the total revenue of the household	%	(+)

The second step in the regression model of Heckman (1979) is to use Ordinary least squares (OLS) estimation method to estimate the amount of on-time loan payment of shrimp farmers. Based on theoretical basis and empirical studies, the authors propose a model to estimate the factors affecting the amount of on-time loan payment of shrimp farmers as follows:

$$REPAYMENT = \alpha + \beta 1EDU + \beta 2ASSET + \beta 3INCOME + \beta 4DEP + \beta 5MATURITY + \beta 6COOPERATION + \beta 7SIZE \quad (2)$$

Table 3 summarizes the characteristics of the variables in the second regression model and the expected signs of the impact of the independent variables on the amount of on-time loan payment of shrimp farmers.

Table 3. Summary of the variables in OLS regression model.

Variable	Measurement Method	Unit	Expected Sign
Amount of on-time loan repayment (REPAYMENT)	Loan amount repaid on the date when payment falls due	Million VND	
Education level of household head (EDU)	Number of schooling years	Year	(+)
Total asset (ASSET)	Total asset value of the household	Million VND	(+)
Income (INCOME)	Annual income of shrimp household	Million VND/Year	(+)
Dependent member (DEP)	Number of dependent members who are under 15 or over 60 years old in the household	Person	(-)
Number of loan maturity (MATURITY)	Number of times that loan matures	Times	(-)
Production cooperation (COOPERATION)	Dummy variable, 1 = Cooperate in production with other individuals or households, 0 = Otherwise	Dummy	(+)
Size of shrimp farming land (SIZE)	The area used for shrimp aquaculture	Hecta	(+)

RESULTS AND DISCUSSION

1. Descriptive statistics of the variables in the research model

The characteristics of the variables in the two-step regression model of this study are described in Table 4.

Table 4. Descriptive statistics of the variables (Obs. = 210).

Variable	Mean	Standard Deviation	Minimum	Maximum
Ability of shrimp farmer to repay loans on time (ABILITY)	0.68	0.47	0	1
Amount of on-time loan repayment (REPAYMENT)	106.59	101.61	0	864.64
Gender of household head (GENDER)	0.88	0.33	0	1
Education level of household head (EDU)	9.32	3.46	0	17
Shrimp farming experience (EXP)	9.43	5.90	1	30
Dependent member (DEP)	1.96	0.84	0	4
Income (INCOME)	187.90	148.53	24	940
Total asset (ASSET)	81.98	138.41	1	1,500
Size of shrimp farming land (SIZE)	2.00	1.46	0.1	10
Farming crop (CROP)	2.01	0.78	1	4
Form of shrimp farming (FORM)	0.58	0.50	0	1
Production cooperation (COOPERATION)	0.38	0.49	0	1
Return on sales (ROS)	0.27	0.64	-3.91	0.94
Loan amount (AMOUNT)	102.11	89.57	10	700
Lending interest rate (INTEREST)	9.90	1.50	6	14
Loan Term (TERM)	1.89	0.98	0.5	5
Loan purpose (PURPOSE)	0.67	0.47	0	1
Number of loan maturity (MATURITY)	0.86	1.06	0	5

The results from Table 4 show that the gender of the respondents is mostly male. More specifically, the number of male heads of household is 184 people, accounting for 87.62%; the number of female respondents is 26 people, accounting for 12.38%. Additionally, the results from Table 4 show that the average number of schooling years is 9.32 years and the standard deviation of this variable is rather small, which is 3.46 years. This demonstrates that the educational level of shrimp farming households in Ca Mau province is relatively low and fairly even. The results from Table 4 also show that the household head has at least 1 year and at most 30 years of experience, and the mean shrimp farming experience is 9.43 years and has a quite low standard deviation of 5.90 years. This means that the number of years of experience in shrimp farming of household heads is fairly evenly distributed with a relatively low disparity.

The results from Table 4 show that the highest number of dependents is 4 people and the lowest is 0, with a mean of 1.96 and a low standard deviation of 0.84. This shows that the number of dependent members of shrimp farming households is evenly distributed and relatively small. The reason is that the number of members in each household is not large, and most of them are of working age and are able to generate income, so the number of dependents in each household is few, which is completely consistent with the real situation in Ca Mau province. Meanwhile, the average income of shrimp farmers in Ca Mau province is 187.90 million VND/year with a large standard deviation of 148.53. The lowest income household is 24 million VND/year and the highest-income household is 940 million VND/year. Hence, the income of shrimp farming households in Ca Mau province is uneven. In addition to residential land and production land, the value of the total assets of households is also determined based on the value of equipment and machinery, savings deposits, and the value of livestock, poultry, seafood, and other assets. The survey results show that households have a total asset value of at least 1 million VND and households with a maximum total asset value of 1,500 million VND. The mean asset value is 81.98 million VND and the standard deviation is 138.41 million VND, which is large. This shows that the total asset value of shrimp farming households in Ca Mau province is unevenly distributed and relatively low.

It can be seen from Table 4 that the size of shrimp farming land of households in Ca Mau province is relatively large. Specifically, the average size of shrimp farming land is 2 ha, the smallest size is 0.1 ha, and the largest shrimp farming area is 10 ha. This shows that the size of shrimp farming land of households is relatively evenly distributed. Besides, the minimum number of farming crops is 1 crop/year, the maximum figure is 4 crop/year, and the average number of farming crops per year is 2.01. This is completely consistent with the reality of natural conditions, climate and production practices of shrimp farmers in Ca Mau province. The results from Table 4 also point out that the majority of households engage in industrial shrimp farming. The reason is that the production practices of farmers in the form of industrial farming in Ca Mau province have existed for a long time and households have only switched to natural farming in recent years. Additionally, the results from Table 4 show that the majority of shrimp farming households do not cooperate in production with other households due to the farmers' farming practices they do not like collaboration in production. On the other hand, the households cultivate shrimp farming based on their personal opinion and experience, so they do not cooperate to produce in order to reduce risks. Thus, the situation of association in the production of farmers is not popular. The profitability of shrimp farming households in Ca Mau province is quite low. More specifically, the lowest ROS is -3.91%/year, which means that the farming households have a loss. The highest ROS is 0.94%/year. The average ratio is only 0.27%/year. This shows that the profitability is low and unevenly distributed among shrimp farming households in Ca Mau province.

The results in Table 4 show that the loan amount of shrimp farming households in Ca Mau province is not large. In specific, the minimum loan amount is 10 million VND and the maximum loan amount is 700 million VND. The average loan amount is 102.11 million VND and this variable has a rather high standard deviation of 89.57. This shows that the majority of shrimp farming households borrow money unevenly and the amount of loan is relatively low. This is also completely consistent with the fact that most farmers are afraid of debt and especially in the field of shrimp farming with many risks, so shrimp farmers often borrow with a small amount of capital. In addition, the average interest rate on a loan is 9.9%/year. However, a few shrimp farming households access credit with very high interest rates (14%/year) because the purpose of borrowing money is not only for agricultural production and shrimp farming, so the lending interest rate is very high. Moreover, the loan term is at least 0.5 years, at most 5 years, with a mean of 1.89 years and a relatively low standard deviation of 0.98 years. This proves that shrimp farming households borrow loans with medium terms and loan terms are equally distributed among households as households borrow seasonally or in groups. However, several households borrow money for many purposes, so the loan term is quite long. Besides that, with long-term borrowing, households often reduce the pressure of debt repayment. Additionally, the majority of shrimp farming households are aware that using capital for the right purposes contributes greatly to the timely repayment of loans and does not affect the reputation of the household when borrowing capital at credit institutions. Therefore, most shrimp farming households use loans for the right purposes.

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From the results in Table 4, it can be seen that the debt repayment ability of shrimp farming households in Ca Mau province is relatively good, specifically, there are 142 households paying loans on time, accounting for 67.62%. The main reason for the late payment of debts of shrimp farming households is mainly due to the lack of output and low selling price, leading to a decrease in household income, and affecting the household's ability to repay loans. The results from Table 4 show that some households have completely failed to make timely repayment. The reason is that these households suffer from crop failure, so revenue is not equal to costs, leading to losses and the inability to repay debts. Besides that, shrimp farming households have the largest amount of on-time repayment of 864.64 million VND, with an average amount of on-time repayment of 106.59 million VND. Thus, shrimp farming households in Ca Mau province have a relatively large amount of on-time repayment. Regarding the number of loan maturity in the borrowing process of shrimp farmers, the results in Table 4 show that some shrimp farming households pay their debts on time and ensure good debt repayment ability. When there is a need for new loans, they will continue borrowing. They do not take out a new loan to pay off one or more outstanding loans. Besides that, the maximum number of loan maturity is 5 times. The reason is that several households lack the capital to meet their production needs, so they have to take out a new loan and pay off the outstanding loans many times. In addition, the average number of loan maturity is 0.86 times. This means that the number of loan maturity of shrimp farming households is quite small as households repay their loans on time, access credit according to the cycle of capital demand to meet the needs of production and business, have enough capital in shrimp farming, and do not take out a new loan to pay off the outstanding loan.

2. Factors affecting the ability to repay loans in a timely manner and the amount of on-time loan repayment of shrimp farmers in Ca Mau province

The estimation results of the two-step Heckman model on the factors affecting the ability to repay loans in a timely manner and the amount of on-time loan repayment of shrimp farmers in Ca Mau province are presented in Table 5.

Table 5. Estimation results of the two-step Heckman model. Note: *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Factor	Ability of shrimp farmer to repay loans on time (ABILITY)		Amount of on-time loan repayment (REPAYMENT)	
	Coefficient	Standard Error	Coefficient	Standard Error
Gender of household head (GENDER)	-0.770	0.499	-	-
Education level of household head (EDU)	0.058	0.042	8.927***	2.028
Shrimp farming experience (EXP)	0.047*	0.027	-	-
Total asset (ASSET)	0.002*	0.001	0.470***	0.047
Income (INCOME)	-0.001	0.001	0.002	0.060
Dependent member (DEP)	-0.604***	0.190	-3.443	9.351
Loan amount (AMOUNT)	-0.006***	0.002	-	-
Lending interest rate (INTEREST)	-3.553	9.444	-	-
Loan Term (TERM)	0.121	0.134	-	-
Loan purpose (PURPOSE)	2.548***	0.338	-	-
Farming crop (CROP)	-0.602***	0.205	-	-
Form of shrimp farming (FORM)	-0.496	0.345	-	-
Return on sales (ROS)	0.388	0.257	-	-
Number of loan maturity (MATURITY)	-	-	-24.684***	7.100
Production cooperation (COOPERATION)	-	-	9.754	13.694
Size of shrimp farming land (SIZE)	-	-	-10.439**	5.234
Constant	2.138*	1.174	5.634	29.901
Lambda	48.092**	20.497	-	-
Wald chi2(7)	165.040	-	-	-
Prob > chi2	0.000	-	-	-

The results in Table 5 show that the p-value for Wald test is 0.0000, suggesting that the model is appropriate. The estimated results of variables in the two-step Heckman regression model are explained as follows:

Estimation results in step 1 in the Heckman regression model on factors affecting the ability to repay loans on time of shrimp farmers in Ca Mau province show that out of 13 variables included in the research model, 6 variables are statistically significant. Specifically, total assets (ASSET) and shrimp farming experience (EXP) are statistically significant at the significance level of 10 percent. Dependent member (DEP), loan amount (AMOUNT), loan purpose (PURPOSE) and farming crop (CROP) are statistically significant at the significance level of 1 percent.

Of the six statistically significant variables mentioned above, three factors have a negative impact on the ability of shrimp farmers to repay loans in a timely manner, including dependent member (DEP), loan amount (AMOUNT) and farming crop (CROP). The negative impact of dependent members (DEP) on the ability of shrimp farmers to repay loans on time in this study is similar to the findings of Kim (1978). In fact, when the number of dependents increases, this leads to an increase in the financial burden on the household head because the dependents do not generate income, which negatively affects the household's ability to repay loans on time. Besides that, the negative influence of loan amount (AMOUNT) on the ability of shrimp farmers to repay loans on time in this study is in line with the studies of Oke et al. (2007); Afolabi (2010). In the study area, the households that borrow a lot are usually those that raise shrimp in the form of industrial farming. The cost of raising in the form of industrial farming is higher than that in the form of natural farming, but the profit is not high or sometimes it may cause a loss. Besides that, some households raising shrimp in the form of natural farming do not use the loan for the right purpose, they only use part of the loan for shrimp farming and use the rest for other purposes. This leads to inefficient use of loans, affecting the ability of households to repay loans on time. In addition, the results in Table 5 also show that farming crop (CROP) has a negative impact on the household's ability to repay loans on time. The reason is that households raising many crops in a year are those who raise shrimp in the form of industrial farming, or those who often deal with natural disasters and diseases, so they have to do many crops in a year but the productivity is low, which strongly influences their ability to repay loans in a timely manner.

The remaining three statistically significant variables have a positive impact on the ability of shrimp farmers to repay loans in a timely manner, including total asset (ASSET), shrimp farming experience (EXP) and loan purpose (PURPOSE). These results are in accordance with the original assumption and the findings of previous studies. The positive impact of the total asset (ASSET) on the ability of shrimp farmers to repay loans on time in this study is similar to the findings of Brehanu & Fufa (2008). The more assets the borrower owns, the easier and more flexible it is to use the loan and participate in shrimp farming activities, contributing to an increase in household income. Therefore, the ability of households to repay loans on time also increases. The positive impact of loan purpose (PURPOSE) on the ability of shrimp farmers to repay loans on time in this study is in line with the findings of Nguyen & Pham (2010). When the loan amount is used for the right purpose of shrimp farming according to the household's original plan, the household will focus more on shrimp farming, thereby improving shrimp farming efficiency and increasing income, so their ability to repay loans on time will be higher. In addition, the results in Table 5 show that shrimp farming experience (EXP) is one of the determinant factors of the ability of shrimp farmers to repay loans in a timely manner. In Ca Mau province, when the household heads have many years of experience in managing production and raising shrimp, it is possible for them to reduce the risks caused by weather and climate conditions as they can choose the right time to raise shrimp. Thus, they can gain higher profits from shrimp farming and are better able to repay their loans on time. In general, when the farm household has more assets as well as more shrimp farming experience and uses the loan for the right purpose, this household is able to improve the production efficiency and gain more profit, so the ability of this household to repay the loan in a timely manner is higher.

Estimation results in step 2 in the Heckman regression model on factors affecting the amount of on-time loan repayment of shrimp farmers in Ca Mau province show that out of 7 variables included in the research model, 4 variables are statistically significant. Specifically, the education level of the household head (EDU), total assets (ASSET) and the number of loan maturity (MATURITY) are statistically significant at the significance level of 1 percent, whereas the size of shrimp farming land (SIZE) is statistically significant at the significance level of 5 percent. In terms of the direction of the impact, the number of loan maturity (MATURITY) and size of shrimp farming land (SIZE) negatively impact the amount of on-time loan repayment of the household. Whereas, the education level of the household head (EDU) and total assets (ASSET) positively influence the amount of on-time loan repayment of the household. These findings are consistent with the original assumption and the research results of Kim (1978). Specifically, the degree of the effect of these variables on the amount of on-time loan repayment of the household can be explained as follows:

The education level of the household head (EDU) has a rather high estimated coefficient which is 8.927, showing that education level has a positive impact on the amount of on-time loan repayment of the household. If the education level of the household head increases by 1 unit, ceteris paribus, the on-time loan repayment amount of the household will increase by 8.927 units. Turning to the total asset (ASSET), this variable has an estimated coefficient of 0.470, showing that the total asset has a positive impact on the on-time loan repayment amount of households. If the total assets of the

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household increase by 1 unit, ceteris paribus, the on-time loan repayment amount of the household will increase by 0.470 units.

In contrast, the number of loan maturity (MATURITY) and the size of shrimp farming land (SIZE) have a negative relationship with the on-time loan repayment amount of the household. Specifically, the number of loan maturity (MATURITY) has an estimated coefficient of -24.684. This means that if the number of loan maturity of the household increases by 1 unit, ceteris paribus, the on-time loan repayment amount will decrease by 24.684 units. In the study area, many shrimp farming households have a large number of loan maturity because they often take out a new loan to pay off one or more outstanding loans. Thus, when the number of loan maturity increases, the amount of on-time loan repayment decreases. Besides that, the results in Table 5 show that the size of shrimp farming land (SIZE) has an estimated coefficient of -10.439, which means that if the shrimp farming area increases by 1 unit, ceteris paribus, the on-time loan repayment amount will decrease by 10.439 units. In fact, the larger the shrimp farming land, the higher the loan amount to serve production needs. However, shrimp farming efficiency and profitability are not high, so the on-time loan repayment amount decreases.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study aims to analyze the determinant factors of the ability of shrimp farmers in Ca Mau province to repay loans on time and the decisive factors of the on-time loan repayment amount, thereby providing several recommendations to improve the loan repayment capacity of the households in the study area. Based on the primary data of 210 shrimp farming households in Ca Mau province, the study applies the two-step regression model of Heckman to estimate the factors affecting the ability to repay loans on time of shrimp farmers in Ca Mau province and the factors influencing the on-time loan repayment amount of these households.

Estimated results of the Heckman regression model in step 1 show that dependent member (DEP), loan amount (AMOUNT) and farming crop (CROP) negatively impact the ability to repay the loan in a timely manner, while total asset (ASSET), shrimp farming experience (EXP) and loan purpose (PURPOSE) positively influence the ability to repay the loan on time of shrimp households. In addition, the OLS regression results in step 2 show that the number of loan maturity (MATURITY) and size of shrimp farming land (SIZE) negatively affect the amount of on-time loan repayment of the household, whereas the education level of the household head (EDU) and total asset (ASSET) positively influence the on-time loan repayment amount.

Although the study has provided empirical evidence of the determinant factors of the ability of shrimp farmers in Ca Mau province to repay loans in a timely manner and the decisive factors of the on-time loan repayment amount, it still has some limitations that may provide further development opportunities for more in-depth researches in Vietnam. Specifically, the study does not conduct survey in the remaining districts of Ca Mau province and does not investigate the impact of input cost factors and the application of science and technology in the shrimp farming process on the loan repayment capacity of shrimp farming households. In addition, the study does not discuss the benefits of on-time loan repayment as well as the consequences of late repayment on the production process of shrimp farming households in Ca Mau province.

Recommendations

Based on given empirical findings, this study provides several recommendations for the government, the State Bank of Vietnam as well as a local authority in order to provide more support to shrimp farming households to improve the loan repayment capacity of these households as follows:

The government should provide more support in terms of the shrimp output, promote trade promotion to increase the value of shrimp products. Thereby, shrimp farmers will be able to sell their products at a higher price, bringing higher profits. The government should develop a comprehensive planning policy on shrimp production by regions, locations and reasonable seasons in order to ensure a stable output for shrimp farmers. The government should direct local authorities in supporting shrimp farmers in their local area. The government should have special credit packages for shrimp farmers such as interest rate support policies in order to reduce borrowing costs and to provide timely and adequate capital to serve the production process, thereby contributing to raising income and improving the living standards of shrimp farming households. The State Bank of Vietnam should direct commercial banks to help shrimp farming households access credit with preferential interest rates under the direction of the government. Simultaneously, the State Bank should inspect and urges commercial banks to strictly comply with the government's guidelines and policies on supporting shrimp farmers.

The local authority should pay more attention to the shrimp production of households and carefully check the environmental factors of shrimp farming to limit the risks caused by the environment in order to help shrimp farming households improve productivity and efficiency. The local authority should mobilize people in general and shrimp farmers, in particular, to participate in classes and technical training courses in order to improve the educational level and technical skills of farm households. The local authority should direct the Bank for Social Policies and the Bank for Agriculture & Rural Development in the area to support shrimp farmers in getting loans with preferential interest rates and to guide shrimp farmers to use a capital for the right purposes and more effectively.

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ДЕТЕРМІНАНТИ ПОГАШЕННЯ КРЕДИТУ ДОМОГОСПОДАРСТВ ІЗ РОЗВЕДЕННЯ КРЕВЕТОК: ЕМПІРИЧНЕ ДОСЛІДЖЕННЯ В ПРОВІНЦІЇ КА-МАУ У В'ЄТНАМІ

Мета цієї статті – проаналізувати визначальні фактори здатності фермерів, які вирощують креветки, вчасно погашати кредити та вирішальні фактори своєчасного погашення кредиту. На основі первинних даних 210 домогосподарств, які вирощують креветки в провінції Ка-Мау, у дослідженні застосовано двоетапну регресійну модель Хекмана для перевірки запропонованих гіпотез. Результати дослідження показали, що кількість залежних членів, сума позики та кількість сільськогосподарських культур негативно впливають на здатність своєчасно погасити позику, тоді як загальні активи, досвід вирощування креветок і ціль позики позитивно впливають на здатність своєчасно погасити позику домогосподарств, що вирощують креветки.

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Крім того, результати регресії також показали, що терміни погашення кредиту та площа земель для вирощування креветок негативно впливають на строк своєчасного погашення кредиту, тоді як рівень освіти голови домогосподарства та розміри сукупних активів позитивно впливають на строк погашення кредиту. Спираючись на емпіричні висновки, автори сформували низку рекомендацій щодо підвищення платоспроможності домогосподарств, які вирощують креветки в цій провінції.

Ключові слова: погашення кредиту, офіційний кредит, домогосподарства з вирощення креветок, двоетапний метод Хекмана, В'єтнам

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