

Research Article

# Factors Influencing the Capacity to Repay Loans on Time of Tea Growing Households

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## Abstract

Tea is the main crop of Thai Nguyen province, Vietnam. Tea is a crop that helps eliminate hunger and reduce poverty, and is a crop that enriches over 91 thousand farming households with many products certified by OCOP (One Commune One Product) and VietGAP (Vietnamese Good Agricultural Practices). In particular, tea-growing households have proactively sought loans to finance organic tea growing activities, aiming at sustainable development. This study aims to analyze the factors affecting the ability to repay debts on time of tea-growing households in Thai Nguyen, Vietnam. The research data is based on a survey of 350 tea-growing households in this area. Heckman's two-step model is used to estimate the influencing factors. The study has shown that the factors affecting the capacity to repay loans on time of tea growing households in Thai Nguyen, Vietnam include 6 factors: Number of dependents, Total loan amount, Number of harvests, Total assets, Purpose of loan use; and Tea growing experience. In addition, there are 5 factors affecting the amount of loan repayment on time of tea growing households including: Education level, total assets, number of maturity periods and tea growing area of the household. Based on the survey data, the study proposes solutions to improve the efficiency of loan use, contributing to better timely loan repayment of tea growing households.

## Keywords

Loans, On Time, Repayment Ability, Thainguyn, Vietnam

## 1. Introduction

Vietnam currently has 34 provinces and cities growing tea. And the "Capital of Tea" or the title "First Famous Tea" is associated with Thai Nguyen land, with the area, productivity, output and value of tea products ranking first in the country. Currently, Thai Nguyen city, Vietnam has the largest tea growing area in the country with over 22 thousand hectares and the total revenue from tea trees in 2023 is estimated at

nearly 13 thousand billion VND. Tea trees have been grown and processed in Thai Nguyen for hundreds of years and are the main and important crop of Thai Nguyen. The soil, water resources, weather and climate conditions in Thai Nguyen are favorable for tea development. The collective trademark Thai Nguyen Tea has been officially protected in many countries and territories around the world. This affirms the prestige,

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quality, reputation and value of Thai Nguyen tea. In August 2006, the Department of Intellectual Property under the Ministry of Science and Technology issued a Certificate of registration of the collective trademark "Thai Nguyen Tea" and the Provincial Farmers' Association was assigned as the owner. This is also the first special product of the province to be protected by a collective trademark. After 12 years, the collective trademark "Thai Nguyen Tea" was successfully registered for protection in the United States, China and Taiwan (China).

Notably, in 2022, the collective trademark "Thai Nguyen Tea" was officially announced for protection in Japan and Korea. This is not only a great joy for tea makers in the province but also a solid affirmation of the prestige, quality, reputation and value of Thai Nguyen tea.

Contributing to enhancing the value and brand of Thai tea is the great contribution of tea farming households in Thai Nguyen. Studying the reality of some tea farming households, we found that tea farming households no longer rely on state agencies but have proactively built and developed brands to enhance the value of tea products. In particular, tea farming households have proactively sought loans to finance organic tea growing activities, aiming for sustainable development. The area and output of both delicious and large tea are the economic development strengths of the province, playing an important role in increasing export turnover, creating jobs and increasing income for people. To achieve the above goal, loans are essential for tea farming households. Although tea farming households currently have better access to loans due to the policy of linking tea farming households and businesses towards sustainability. However, many households still have difficulty accessing bank loans to serve tea growing, because they have not been able to repay old debts but can only "borrow new to repay old", so they lack capital to invest in tea growing, not to mention limited loans, not meeting the production requirements of farmers. In fact, tea growers in Thai Nguyen province face many risks when using loans such as bad weather, prolonged cold, epidemics, mass plant deaths, changing demand from domestic and foreign partners leading to changes in revenue, using loans for the wrong purposes such as medical treatment, sending children to school, weddings, etc. The above factors affect the efficiency of loan use, leading to the ability to repay debts on time. However, whether farmers repay debts on time to official credit institutions or not is very important, to consider the bad debt status of customers. Tea growers need to have solutions to use loans for the right purposes, achieve production efficiency, limit the situation of becoming customers with bad debts to improve the ability to access loans better. Therefore, this article is written to provide solutions to support capital for tea growers in the production process, contributing to the socio-economic development of the locality and improving the lives of farmers in the province.

## 2. Theoretical Framework

For farmers in general, including tea growers, after borrowing capital, how to use that capital and whether it is effective or not is an issue, because using capital effectively will contribute significantly to the ability to repay loans on time. This issue has been analyzed by a number of domestic and foreign authors.

The loan repayment ability of households farmers has been studied in many literatures. Various analytical techniques have been used in the efforts of analysts to explain the impact of some variables on the loan repayment ability of farmers. In Afolabi's study, the techniques used is ordinary least squares (OLS) regression techniques [1, 19, 20]. Some studies used logit/probit analysis [12, 23, 30]. Another used Tobit analysis [9, 15]. There is also discriminant analysis [6]. Authors have attempted to measure the dependent variable, loan repayment ability, in different ways and model.

Firstly, the actual amount outstanding has been used in Oladebo's study with ordinary least squares (OLS) regression analysis of the determinants of loan repayment among farmers in the Ogbomoso agricultural area of Oyo State, Nigeria [20].

Secondly, The following studies used dependent variable as the proportion of the loan due at a given point in time that was actually paid [1, 9, 19]. While the surveys by Afolabi and Gebeyehu used OLS models [1, 9]; Oke et al. used Tobit models in their survey [19].

Thirdly, dummy variables measured as 1, if the borrower paid off the loan and 0, otherwise, were used as the dependent variable for the logit/probit analysis [12, 15, 23, 30].

Fourthly, some studies attempts to use discriminant analysis to identify dependent variable that classify farmers into non-defaulters and defaulters. In the case of defaulters, the authors classify into intentional and unintentional defaulters [1, 26].

According to Kim, the results of a two-step regression analysis for a sample size of 207 households surveyed in Korea. The study showed that the capacity to pay loans of households in the South, Korea is affected by the level of education, age of the head of household and the number of dependents in the household [11]. Of which, the number of households that repay loans late accounts for 37.68% of the total number of households surveyed.

In addition, Oke et al. analyzed the factors affecting the capacity to pay loans of farmers to microcredit organizations in Southwest Nigeria [19]. The results of the linear regression model showed that the significant influencing factors included: income, loan amount, business investment amount and number of days from loan application to disbursement. In addition, Afolabi concentrated the capacity of repayment loan of small farmers in Oyo State, Nigeria [1]. The results of ordinary least squares (OLS) estimation were used and found the total loan amount, interest rate, production scale and non-farm income affected the loan repayment capacity of farmers. On the other

hand, the study showed that the ability of farmers to repay loans on time was positively correlated with post-loan income and the number of independent with income. The study also showed that there is a relationship between the education level of the household head and the ability to repay loans on time. The study also shows that households borrowing capital for agricultural production are higher than those borrowing for non-agricultural purposes.

Trinh and Ky conducted a study related to the timely repayment of loans when borrowing official capital of farmers in Can Tho city [29]. The results of the Probit model estimation showed that the loan interest rate is inversely proportional to the capacity of household to pay loans on time, while the factors such as loan purpose, household income in the year and number of members with income in the family affects directly on the capacity of household to pay loans on time.

#### *Research Hypothesis*

Gender of household head (gender): Male household heads are perceived to be more likely to repay loans on time than female household heads because they are healthier, have better access to production resources, and thus harvest more, and have more financial resources to repay loans on time [14]. Furthermore, male household heads are more likely to be financially independent than female household heads [7]. Empirical results also show that male household heads tend to be granted higher credit because of their higher repayment ability [3, 16, 22, 31]. Therefore, male household heads are more likely to repay loans on time than female household heads. Therefore, the author proposes hypothesis:

H1: Male tea farming household heads are more likely to repay their loan on time than female household heads.

Tang in a survey study in China concluded that education is one of the significant explanatory variables for the capacity to pay loans on time of farmers [27]. The study showed that each additional year of education of the head of household will increase the capacity to borrow and repay loans on time by 2.5%. This is because households with higher education level inherently have a good economic foundation, so they will be able to repay loans on time. Therefore, the author proposed the hypothesis:

H2: Education level has a positive relationship with the capacity to pay loans on time of tea farming households.

Number of dependents in tea farming households: Implies dependents and the number of workers in the family. The larger the number of people in a household, the less resources available for debt repayment, and the less likely the tea farming household is to repay the loan on time [1, 19]. Therefore, household size is considered to have a negative impact on the decision to borrow money. The author proposes the following hypothesis:

H3: The larger the number of dependents in a tea farming household, the less likely it is to repay the loan on time.

Income: Used to assess the economic status and repayment capacity of tea farming households. The impact of income on borrowing decisions is shown in the study of Gershon et al. [8]:

Households with high income and savings are often in good financial position, so these tea farming households will be able to repay their debts on time. Chen and Chiivakul argue that households have a need to borrow when their current income and savings are at a high level - they expect to be able to further improve this income level in the future [4]. Therefore, the author hypothesizes.

H4: The income of tea farming households and the ability to repay debts on time have a positive relationship.

Total household assets: Specific farm characteristics that have been widely reported to influence loan repayment include farm size, amount of investment [1, 19]. Afolabi found that farm size had a positive effect on the capacity of repayment loan in smallholder farmers in Oyo State [1], while Udoh found that farm size had a negative effect to default among farmers who benefited from agricultural loans in Akwalbom State, Nigeria [31]. The authors therefore hypothesize.

H5: The value of tea farmer household assets is positively related to the ability of household to repay loans on time.

The actual amount of loan (principal and accrued interest) of the borrower affects the repayment capacity of tea farming households in the study of Oladeebo and Oladeebo [20]. They used OLS regression analysis on the determinants the capacity of loan repayment of farmers in the Ogbomoso agricultural area of Oyo State, Nigeria. Therefore, the author hypothesized.

H6: The principal loan amount of tea farming households has a positive relationship with the ability of household to repay loan on time.

Trinh and Ky conducted a study related to the timely repayment of loans when borrowing official capital of farming households in Can Tho city [29]. The results of the Probit model estimation showed that the loan interest rate is inversely proportional to the capacity of farming households to pay loans on time. Therefore, the authors proposed the hypothesis.

H7: The interest rate of loan has an inverse relationship with the capacity of tea farming households to pay loans on time.

Many study reported loan characteristics that impact loan repayment include the loan amount granted or the size of a loan, the interest rate of the loan, the length of time between the loan application and the disbursement [12]. Therefore, the authors propose the following hypothesis:

H8: The loan duration is negatively related to the likelihood of timely loan repayment.

Among the borrower specific socio-economic factors commonly reported that affect the capacity of loan repayment are the age of the borrower [1, 12, 20, 23, 25], agricultural experience, including crop and livestock farming [2, 18]. Therefore, the authors propose the following hypothesis:

H9: Tea farming experience is positively related to the capacity of tea farmer to repay loans on time.

Loc & Binh studied the capacity to pay loans on time of

farming households in Hau Giang, Viet Nam [13]. The research results showed that the income of the household head and the number of harvests were positively correlated with the capacity to pay loans on time of farmers. Therefore, the authors put forward the following hypothesis:

H10: The number of tea harvests positively affects the capacity to pay loans on time of tea farmers.

Nghi studied the capacity to pay loans on time of farming households at the Bank for Agriculture and Rural Development, Hau Giang branch [17]. The research results showed that the factors of the household head's education level, the purpose of using loans for organic farming and livestock, and people friendly farming were directly correlated with the capacity to pay loans on time of farming households. Therefore, the author proposed the following hypothesis:

H11: Loans for organic tea farming, people-friendly, and the environment positively affect the capacity to pay loans on time of tea farmers.

In Afolabi's study on small farmers in Oyo State, Nigeria, using OLS regression technique, he indicated that borrowers' farming experience and profit had a positive effect on loan repayment. Otherwise, family size and non-farm expenses had a negative effect to the repayment of loan [1]. Therefore, the authors proposes the following hypothesis:

H12: Profit from tea farming has a positive relationship with the capacity of tea farmers to repay loans on time.

rectly interviewing 350 tea-growing households in Thai Nguyen province, Vietnam. These households were selected from the list of loan customers of banks in Thai Nguyen province. The author selected two banks that provided the most loans to tea-growing households, which are the Vietnam Bank for Agriculture and Rural Development and the Thai Nguyen branch of the Vietnam Bank for Social Policies. Specifically, from the list of loan customers for tea growing of the two banks mentioned above, the simple random sampling method using the Random function on Excel was used to select the households to be surveyed.

The sample size of the survey was determined according to Tabachnick & Fidell, the minimum sample size required was calculated according to the formula  $n = 50 + 8 * m$  (m: number of independent variables) [28]. The proposed research model has 12 independent variables (equation 3). Therefore, the required sample size of the study is 154 observations. However, to ensure representativeness, this study surveyed 350 households.

*Analysis method*

The survey data includes both households that repay loans on time and households that do not repay loans on time. If only estimating the regression model with the observed variables being households that "repay loans on time", the regression model will not accurately reflect the factors explaining why some tea-growing households do not repay loans on time. Ignoring the group of households that repay loans late will bias the estimated regression parameters obtained from the sample and misreflect the level of impact of factors on the amount of loans repaid on time of tea-growing households in Thai Nguyen. To overcome this drawback, the two-step regression model of Heckman is used to estimate the factors that impact the capacity to pay loans on time of tea-growing households in Thai Nguyen [10].

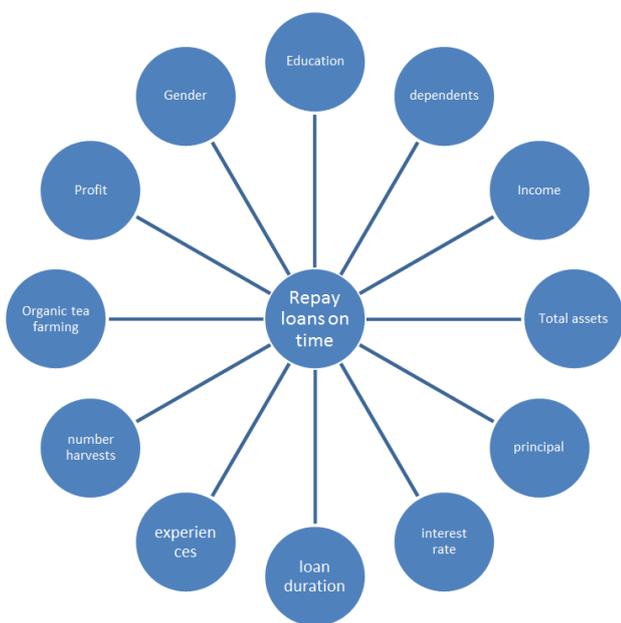
The two criteria for assessing the capacity to pay loans of tea farmers are the ability to pay loans on time and the amount of loans repaid on time of tea-growing households.

\* Step 1: Model to estimate factors that impact the capacity to pay debts on time of tea growing households in Thai Nguyen province. The first step is to use a probability model in Heckman's regression model to estimate the value of the dependent variable called the ability to repay debts on time or not on time of tea growing households [10]. The model has the form like that:

$$Y = \alpha + \beta_i X_i + \omega_i \tag{1}$$

In which:

- Y: Dependent variable, takes two values:
- Y = 1, the i th tea growing household repays the loan on time
- Y = 0, otherwise
- $\alpha$ : Intercept coefficient
- $\beta_i$ : Regression coefficient (i = 1, n)
- $X_i$ : Independent variables



Source: Author's own data compilation

Figure 1. Research Model.

### 3. Research Methodology

*Data collection method*

The primary data used for this article was collected by di-

$\omega$ : Error  
Based on theoretical basis, empirical studies, results are summarized and assumptions are made about factors affecting

the capacity to pay loans on time of tea farmers with a specific model as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} \quad (2)$$

In which:

The dependent variable Y is a variable measuring the capacity to pay loans on time of tea growing households in Thai Nguyen, Vietnam. Y takes the value of 1 if tea growing households repay loans on time, 0 otherwise.

Independent variables are represented by variable names and measurement methods in [Table 1](#).

**Table 1.** Interpretation of independent variables used.

Variables	Code	Interpretation	Source
Gender	X1	Dummy variable, 1 if the household head is male, 0 if the household head is female	Mpuga, 2010; Frankellis, 1993; Hhaudhuri & Cheral, 2011; Nwaru et al, 2011; Omonona et al, 2008; Zeller, 1994.
Education	X2	The education of the household head is calculated by the number of years of schooling of the household head.	Kim, 1978; Tang, 2011
Dependent members	X3	Number of dependent members in tea farming households (persons)	Oke et al., 2007; Afolabi, 2010; Loc & Binh, 2011; Trinh & Ky, 2012; Nghi, 2013
Total income	X4	Total income of all individuals in the household after loan (million VND/month)	Chiivakul, 2008); Gershon et al., 1990
Total assets	X5	Total value of household assets (million VND)	Oke et al., 2007; Afolabi, 2010
Principal	X6	Is the amount of money that the household borrows from the bank (million VND)	Afolabi, 2010; Trinh & Ky, 2012
Interest rate	X7	Interest rate payable by households when borrowing from banks (%/month)	Oke et al., 2007
Time period	X8	The period of time calculated from the date the borrower receives the first loan until the date of full repayment of principal and interest as agreed in the Debt Acknowledgement Agreement (months)	Kim, 1978; Loc & Binh, 2011; Nghi, 2013
Experiences	X9	Number of years since household started growing tea up to present (years)	Njoku, 1997; Arene, 1992
Harvests	X10	Number of tea harvests/year	Oke et al., 2007; Afolabi, 2010; Loc & Binh, 2011
Organic tea	X11	Dummy variable, 1 if organic tea is grown, 0 if tea is grown by other methods	Afolabi, 2010; Trinh & Ky, 2012; Nghi, 2013
Profit	X12	Profit margin/total revenue of household (%)	Oke et al., 2007; Afolabi, 2010

Source: Author's own data compilation

\* Step 2: The model estimates factors that impact the amount of loan repayment on time of tea growing households: In this case, the capacity to pay loans on time of tea growing households is measured by the amount of loan repayment on time to official credit institutions. To estimate the amount of money that tea growing households repay on time to credit institutions, the ordinary least squares (OLS) estimation

method is used in the second step of Heckman's model. However, to eliminate observations that households do not pay loans on time or the amount of loan repayment on time is 0 and to overcome the situation of incorrect expected sign as in the original Tobit model, the Heckman selection regression method is used.

In summary, the two-step Heckman regression method has

some outstanding advantages such as allowing the use of information from farmers that pay late to enhance the estimated values of variables in the regression model [5]. In this paper, the Heckman regression model will evaluate the reasons why some tea-growing households pay their debts on time, others do not pay their debts on time. At the same time, the model results also explain why some tea farmers pay a large amount of debt on time, while some households pay a

smaller amount of debt on time. In addition, the model also shows how to check the suitability of the model and the impact level of independent variables on the separated dependent variable.

Based on theoretical basis, empirical studies, results are summarized and assumptions are made about factors that impact the capacity to pay loans on time of tea growing farmers with a specific model as follows:

$$\text{Repay} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \quad (3)$$

In which:

Dependent variable Repay is the amount of debt repayment on time (unit is million VND) that tea growing household i

pays to official credit institutions.

Independent variables (X): are represented by variable name and measurement method in Table 2.

**Table 2.** Interpretation of independent Variables.

Variables	Code	Interpretation	Source
Education	X1	The education of the household head is calculated by the number of years of schooling of the household head.	Kim (1978)
Dependent members	X2	Number of dependent members in tea farming households (persons)	Oke et al. (2007) Afolabi (2010)
Total income	X3	Total income of all individuals in the household after loan (million VND/month)	Oke et al. (2007) Afolabi (2010)
Total assets	X4	Total value of household assets (million VND)	Kim, 1978; Oni, 1999
Maturity times	X5	Number of bank maturity times of tea growing households (times)	Kim (1978)
Land	X6	Land area used by farming households for tea growing activities (hectares)	Kim (1978); Afolabi (2010)
Linkage	X7	Dummy variable, linkage in production with other individuals or households (yes = 1; other = 0)	Kim (1978)

Source: Author's own data compilation

## 4. Research Results

### *Demographic characteristics of tea-growing households*

The following information describes the demographic characteristics of tea-growing households in Thai Nguyen, shown in Table 3.

In the survey sample of this paper, the gender is mainly male, specifically, the tea growing household heads are male with 184 people accounting for 59%; female is 126 people accounting for 41%.

The results of Table 4 show that the age of the survey subjects is relatively young, the level is not high and even, the experience is not much and evenly distributed. The reason may be that the surveyed subjects are the children of the

household heads, continuing the profession of the previous generation participating in tea growing.

**Table 3.** Gender characteristics.

Gender	Number	Percentage (%)
Female	146	42
Male	204	58
Total	350	100

Source: Author's own data compilation

**Table 4.** Description of characteristics of age, level, experience of household heads.

Indicator	Observation	Average	Standard Deviation	Minimum	Maximum
Age	350	40,92	9,48	25	80
Education (Years of Education)	350	12,32	9,46	6	17
Experience (Years)	350	13,43	6,90	3	30

Source: Author's own data compilation

#### *Current status of tea growing activities of farmers in Thai Nguyen*

The current status of tea growing activities of farmers in Thai Nguyen in the period of 2021 - 2023 is shown in [Table 5](#).

**Table 5.** Current status of tea growing of farmers.

Indicator	Observation	Average	Standard Deviation	Minimum	Maximum
Tea growing area (hectares)	350	3,00	1,86	0,1	10
Number of tea growing seasons (seasons/year)	350	7,01	6,78	4	9
Tending time (months/season)	350	2,54	2,31	2	6
Output (tons/year)	350	6,96	4,66	2,08	16

Source: Author's own data compilation

The survey results show that tea farmers have nearly equal tea growing areas and similar number of harvests, which is completely consistent with reality, because households often plant and harvest tea at the same time and in the same season. The planting time depends on the variety but is mostly the same. Therefore, the harvested yield is relatively similar and mostly low. The reason may be that households grow tea in an organic, nature-friendly form, with low yield.

#### *The current situation of loan repayment of tea growing households*

The situation of timely loan repayment of tea growing households in Thai Nguyen is shown in [Table 6](#).

The results from [Table 6](#) show that the capacity to pay loans on time of tea growing households in Thai Nguyen province, Vietnam is relatively good, specifically, 198 households repay loans on time, accounting for 64%; the remaining 112 households repay loans late, accounting for 36%. The main reason for late repayment of tea growing households is that the tea harvest does not reach the output and the price is not

good, leading to a decrease in income of tea growing households, affecting the capacity to pay loans on time of the tea farmers.

Factors that impact the capacity to pay loans on time of tea growing households in Thai Nguyen.

The results of estimating the model of factors that impact the capacity to pay loans on time of tea growing households are presented in [Table 7](#).

**Table 6.** Households' ability to repay loans on time.

Ability to repay	Number	Percentage (%)
On-time repayment	218	62
Late repayment	132	38
Total	350	100

Source: Author's own data compilation

**Table 7.** Results of estimating step 1 of the Heckman model.

Variables	Code	Coefficient	Standard Error	P
Gender	X1	-0,771	0,498	0,103
Education	X2	0,057	0,043	0,145
Dependent members	X3	-0,605	0,190	0,001***
Total income	X4	-0,000	0,001	0,522
Total assets	X5	0,002	0,001	0,070*
Principal	X6	-0,006	0,002	0,005***
Interest rate	X7	-3,553	9,444	0,707
Time period	X8	0,120	0,133	0,348
Experiences	X9	0,047	0,027	0,063*
Harvests	X10	-0,601	0,206	0,003***
Organic tea	X11	-0,497	0,345	0,152
Profit	X12	0,389	0,257	0,131
Coefficient		2,138	1,174	0,068
Wald chi2(7)				165,040
Prob > chi2				0,000

Note: \*, \*\*, \*\*\* correspond to significance levels of 10%; 5% and 1%  
Source: Author's own data compilation

The estimation results show that the Wald test value of the model has  $p = 0.000$  which is very small compared to  $\alpha = 1\%$ , which allows us to reject the hypothesis  $H_0$  at the 1% significance level, meaning that the factors in the model can be used to explain the ability to repay loans on time of tea growing households in Thai Nguyen province, Vietnam. In other words, the model used is appropriate.

Table 7 shows that out of 12 independent variables included in the research model, 05 variables have a statistically significant at the 1% and 10% significance levels. Specifically, the variables that are statistically significant at the 10% level include the total assets variable and the household's tea growing experience variable. The remaining variables are statistically significant at the 1% level such as: number of dependents, total loan capital and number of farming seasons. Of the 05 statistically significant variables mentioned above, there are 03 variables that have a negative effect on the capacity to pay loans on time of tea growing households, which are the members that dependent in household, total principle of loan and number of crops. This negative effect is similar to previous studies. Specifically, the dependent member variable (with the sign of the estimated parameter being negative) is similar to the studies of Kim and Nghi [11, 17], this group of authors believes that the number of dependents in the family has a negative impact on the capacity to pay loans on time of farming households. In fact, the survey shows that when the number of dependents in the household increases, it will in-

crease the financial burden on the household head because dependents use income from the family, so the family's income is reduced compared to households with fewer or no dependents, which negatively affects the capacity to pay loans on time.

In addition, the Principal variable (with the negative sign) is similar to the studies of Oke et al. and Afolabi [1, 19], these authors also demonstrated that the loan amount has a negative influence on the capacity of households to pay loans on time. In fact, in the survey area, tea farmers with large loans are often those who grow tea in an industrial form, with higher care costs than those who grow organic, nature-friendly crops, but the profits are not high or some-times there are losses, or it may also be the case that some farming households take care of organic, natural tea plants but the loan is not used for the right purpose. The harvests variable in the model also has a negative influence on the capacity of households to pay loans on time. Because, in this case study, households that harvest many crops a year often focus on households that grow tea plants industrially, or households that encounter natural disasters or epidemics while cultivating tea plants, thus cultivating many crops but the output and productivity are low, affecting the capacity of tea growing farmers to pay loans on time.

The remaining two variables that are statistically significant with the estimated coefficient sign in the same direction as the ability to repay debts on time of tea-growing households are

the total assets variable and the tea growing experience variable of tea-growing households. This result is similar to Afolabi's study, the more assets a borrowing household has, the more it participates in tea growing activities, leading to higher income, so the capacity to pay debts on time of tea-growing households also increases [1]. In addition, the estimated result of the tea growing experience variable of the household is also consistent with the author's initial proposal. A survey of tea-growing households in Thai Nguyen shows that if the household head has many years of experience in

managing and caring for tea hills, he can avoid the risk of unfavorable weather, choose the right time to plant and harvest, so there will be less loss, so the profit from tea growing is higher, so these households have a better ability to repay debts on time. In addition, the relationship between factors and the amount of timely debt repayment of tea growers in Thai Nguyen is estimated in the second step of the Heckman model with the Heckman selection regression method used.

The estimation results are shown in Table 8.

**Table 8.** The estimation results of the second step of the Heckman selection regression.

Variables	Code	Coefficient	Standard Error	P
Education	X1	8,927	2,028	0,000***
Dependent members	X2	-3,443	9,351	0,713
Total income	X3	0,002	0,060	0,978
Total assets	X4	0,470	0,047	0,000***
Maturity times	X5	-24,684	7,100	0,001***
Land	X6	-10,439	5,234	0,046**
Linkages	X7	9,754	13,694	0,476
Coefficient		5,634	29,901	0,851
Lambda		48,092	20,497	0,019**
Rho				0,683
Sigma				77,172

Note:\*, \*\*, \*\*\* correspond to significance levels of 10%; 5% and 1%  
Source: Author's own data compilation

The estimated model results have a Rho index of 0.623, meaning that the correlation with OLS is 68.3%, and the sigma index is also statistically significant. The results in Table 7 show that out of the 07 dependent variables included in the model, 04 variables have significant impacts. Specifically, the education level variable, the maturity variable and the total assets variable are significant at the 1% level. The tea growing area variable is significant at the 5% level. In which, the maturity variable and the tea growing area have a negative impact on the amount of money that the household can repay the loan on time. The education level and total assets variables have a positive impact on the amount of money that the tea growing farmers can pay the loan on time. This research results are consistent with the initial expectation and similar to Kim [11]. The impact of the variables on the amount of time-to-pay loans of tea-growing households is as follows:

The the level of education variable has a fairly high estimated coefficient (8.927), which shows that the education level has a positive influence on the capacity to pay loans of households. Next is the total assets variable with an coefficient

of 0.47. So total assets have a fairly good influence on the capacity to pay loans of households. However, the maturity variable and the tea growing area have a negative influence on the capacity to pay loans of households. Specifically, the maturity variable has an estimated coefficient of -24.684. In fact, tea-growing households have many times of bank maturity, meaning that they borrow from banks many times, but in reality, these are "new loans, old loans". In addition, the tea growing area variable has an estimated coefficient of -10.439. The larger the tea growing area, the higher the amount of loan capital to serve production needs. In addition, if the efficiency of tea growing is not high, the amount of money that can be used to re-pay the loan on time will decrease.

## 5. Conclusion

Thai Nguyen province, Vietnam has planned tea growing areas early and built appropriate support mechanisms, policies and solutions to turn tea into a spearhead of the agricultural

economy, creating high and sustainable income for the people. Currently, the whole province has over 22,300 hectares of tea and is the province with the largest tea growing area in Vietnam with a fresh tea bud yield of nearly 12 tons/ha, fresh tea bud output of more than 250,000 tons/year.

In recent years, many tea growing households in Thai Nguyen province have boldly invested in converting production to organic direction to aim for sustainable development of tea plants, protect the health of producers as well as consumers and affirm the quality as well as build the brand of clean agriculture of the locality.

Thai Nguyen organic tea is a type of tea grown according to the correct organic agricultural process. This process uses many agricultural methods to eliminate pests and weeds without using or minimizing the amount of pesticides and chemical fertilizers.

Organic agriculture will make the soil more fertile and rich in protein as well as contribute to preserving natural minerals in the soil, protecting water quality as well as the surrounding natural environment. The most important feature of Thai Nguyen organic tea farming process is to balance the inherent natural ecosystem. Therefore, Thai Nguyen tea produced according to organic farming process is one of the smart consumer choices because it not only has safe products but can also protect local vegetation.

Thai Nguyen province strives to have a tea area of 23,000 hectares by 2025, 80% of the tea area is concentrated according to VietGAP and organic standards. By 2030, the tea area will reach 24,000 hectares, 100% of the concentrated tea production area will apply VietGAP and organic standards. 100% of tea products will be produced by enterprises, cooperatives or in association with enterprises, cooperatives and farming households according to safety standards, with their own brands.

To improve the quality, value and competitiveness of tea products in the market, Thai Nguyen province has focused on investing in synchronous development from raw tea production to processing and consumption associated with the application of science and technology. At the same time, building brands and protecting intellectual property rights for tea products in the domestic and international markets. Therefore, the author has focused on researching the timely debt payment of tea growing households in Thai Nguyen city, Vietnam to find solutions and remove the problem of late debt payment of tea growing households.

The study has shown that the factors influencing the capacity to pay loans on time of tea growing households in Thai Nguyen, Vietnam include 6 factors: Number of dependents, Principal amount, Number of harvests, Total assets, Purpose of loan use and Tea growing experience. The survey data shows that there are 5 factors influencing the amount of loan repayment on time of tea growing households including: Education level, total assets, number of maturity times and tea growing area of the household. On this basis, the study proposes solutions to improve the efficiency of loan use to con-

tribute to better timely loan repayment of households:

First, tea growing households need to expand some other types of production and business such as: livestock and poultry farming; small trading... to create more sources of income, improve life, reduce family expenses, thereby contributing to improving the ability to repay bank loans for tea growing households. In addition, households need to save on household expenses and improve tea growing efficiency to contribute to timely loan repayment.

Second, when tea growing households borrow capital, credit officers need to carefully consider and clearly advise on the purpose of capital use and how to use capital to achieve high efficiency. At the same time, tea growing households need to consult credit officers on how to use capital for production and business purposes to achieve high efficiency. Avoid the situation where borrowed capital is used for many things, but when the main need is, there is a lack of capital, leading to inefficiency.

Third, households should not grow tea many times a year, because it does not bring high profits but also increases costs, thereby influencing the capacity to pay debts on time. Tea growers when fertilizing in a safe, nature-friendly way, organic is better than in case the number of planting crops increases due to disease, they have to replant or they are impatient to harvest early to force the next crop, thereby affecting the quantity and quality of the product, so they cannot sell at a good price, reducing the household's income, contributing to reducing the household's ability to repay loans on time. Thus, tea growers in a clean, safe, organic, nature-friendly way also need to learn good growing techniques to ensure quality and quantity, limit the death of tea trees and the need to replant, increasing the cost of raising and reducing the household's income.

Fourth, tea-growing households need to arrange and use assets properly and appropriately, avoiding the situation of investing too much in entertainment assets, decrease in the income of tea growing income, reducing the amount of farmers assets, negatively affecting the capacity to pay bank loans. Therefore, tea-growing households should increase total assets in areas that generate income for the household, which will help the household increase the amount of assets and increase the ability to pay loans.

Fifth, tea-growing households need to arrange and put the loan capital into the right purpose of growing tea according to the approved loan application, avoiding the situation of using the loan capital for other purposes such as spending or purchasing equipment and other assets that do not serve the production and cultivation of tea trees, leading to increased costs and no profit for the household. In addition, credit officers need to monitor and provide detailed advice to households on how to use loans for the right purpose and most efficiently. At the same time, tea growers need to consider and strictly manage the loan capital for each specific production purpose, in order to reduce capital costs and bring high profits, contributing to improving the ability to repay bank loans for

tea growers.

Sixth, tea growers need to promote their existing strengths in cultivation experience, and at the same time regularly exchange experiences and learn from more successful tea growers, to have directions and methods of reasonable fertilization, thereby improving production efficiency, helping to improve income and improve the capacity to pay loans on time. Tea growers should regularly participate in technical support training courses organized by specialized agencies and experts in tea cultivation, fertilization techniques, accumulate more experience, helping tea growers achieve high efficiency in both quantity and quality, in order to contribute to improving income and the capacity to pay loans on time.

## Abbreviations

OCOP	One Commune One Product
VietGAP	Vietnamese Good Agricultural Practices

## Author Contributions

**Thi Phuong Dung Ha:** Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

**Nam Duong Tran:** Data curation, Investigation, Resources, Validation, Writing – original draft

**Duc Hung Ha:** Formal Analysis, Methodology, Software, Visualization, Writing – review & editing

## Conflicts of Interest

The authors declare no conflicts of interest.

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