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Factors Affecting the Decision of Rural Households to Participate in Non-Agricultural Activities in Dien Bien Province

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Abstract: The paper examines factors affecting the decision of rural households to participate in non-agricultural activities in Dien Bien province through the Logit model, using the Vietnam Access to Resources Household Survey 2016 by the General Statistics Office of Vietnam. The results indicated that the decision to participate in non-agricultural activities is driven by both "push" and "pull" factors, but there is also an indication of an "ability" factor at work. Access to the information variable has the greatest influence on the decision of households to participate or not. Moreover, education is not significant and has no influence on the decision to engage in non-agricultural activities of households in rural area of Dien Bien province. Based on the findings, as well as the rural development orientation of Dien Bien province, the author proposes some solutions to promote rural non-agricultural economic development. Rural non-agricultural development policies should attend to promotion of the education level of rural households and create favorable conditions for households to access resources.

Keywords: Non-agricultural activities, rural households, Dien Bien province.

1. Introduction

Dien Bien is a mountainous border province in the Northwest region of Vietnam, sharing a border with Laos in the West and South China in the North. Besides, Dien Bien is also connected to the Red River Delta of Vietnam and neighboring provinces by National Highways 6 and 12, and inland waterway by the Da River system. The area of agricultural land accounts for 92.61% of the natural area of the province, while the area of non-agricultural land is only 2.83% (Dien Bien Statistics Office, 2022). Accordingly, the rural population makes up 84.80% of the total population of Dien Bien. However, climate change has had a significant impact on Dien Bien

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recently. There has been an increase in the frequency and intensity of extreme weather events, including heavy rainfall and associated flooding. These phenomena not only affect people's lives but also cause serious damage to farmers' agricultural production.

In the period 2017-2021, Dien Bien recorded a clear change in the rural economic structure of the non-agricultural sector. The economic structure of the province has shifted towards increasing the proportion of industries and services, gradually reducing the agriculture, forestry and fishery sectors. According to data from the Dien Bien Statistical Yearbook 2021, industry and construction increased by 8.5%, and service industries rose by 5.99% over the period of five years from 2017 to 2021. Consequently, the annual economic growth rate of the province has been quite good compared to other provinces with the same conditions. The growth rate of gross regional domestic product reached 6.05% over the period of 2017-2021, increasing by 6.01% in 2021 compared to 2020 (Dien Bien Statistics Office, 2022). The economic structure of the province has shifted in a positive direction, increasing the proportion of industries and services, and gradually reducing the agriculture, forestry and fishery sectors.

Looking at the past, non-agricultural activity in rural areas has been the concern of many researchers around the world. According to Lanjouw and Lanjouw (2001), non-agricultural activities in rural areas are income-generating activities in rural areas that are not part of agricultural activity. In 2003, Davis argued that non-agricultural economic activities are activities that are not part of the original types of agricultural activities such as farming, animal husbandry, fishing, and hunting. In other words, non-agricultural economic activities in rural areas are income-generating activities that do not fall under the original agricultural category, either through waged work or in self-employment. Another concept introduced by Abdulaziz et al. (2019) was that non-agricultural activities are all economic activities such as manufacturing, service, and mining and extractives except agriculture, livestock, fishing and hunting. This definition comes true regarding the area and types of non-agricultural activity. Non-agricultural activity includes activities that do not directly relate to traditional agriculture in rural areas and access local resources to provide rural people with a good source of income and employment.

In Vietnam, non-agricultural activity has become the goal of Vietnam's rural modernization and industrialization process. Non-agricultural economic development plays an important role in rural modernization, restructuring the rural economy in a positive way, and improving the quality of life of rural people.

Therefore, the purpose of this paper is to answer two research questions:

RQ1. What factors affect the decision of rural households to participate in non-agricultural activities in Dien Bien province?

RQ2. Which solutions are proposed to promote non-agricultural activities of rural households in Dien Bien province?

2. Literature review and methodology

2.1. Literature review

This section focuses on two aspects to form the proposed research model. The first focuses on the theory of "pull" and "push" factors involved in the non-agricultural activity of farm households. The second focuses on the empirical evidence of the factors affecting farmers' decisions to participate in non-agricultural activities.

This study relies on the theory of "pull" and "push" factors proposed by Reardon T. (1998) and Davis and Pearce (2000). Reardon (1998) offers the following "push" factors: (1) population growth, (2) increased scarcity of productive land, (3) reduced access to fertile soil, (4) decreased soil fertility and productivity, (5) decreased basic natural resources, (6) decreased revenue for agriculture, (7) increased demand for money in life, (8) events and shocks occurring, (9) lack of access to input markets for agricultural production, (10) lack of rural financial markets. In addition, he suggested "pull" factors such as (1) higher revenues of non-agricultural workers, (2) higher revenues when investing in the non-agricultural sector, (3) lower risks of the non-agricultural sector compared to the agricultural sector, (4) generating cash to meet the spending needs of families and (5) more

opportunities to invest. In short, the "pull" factor presents the attractiveness of the non-agricultural sector to farmers. The "push" factor involves the pressure or restrictions of the agricultural sector that force farmers to seek other income if they want to improve their living conditions. Davis and Pearce in 2000, when analyzing the characteristics of the rural nonfarm economy, also systematized the factors affecting the decision of rural households to participate in non-agricultural activities as follows:

Table 1: "Push" and "pull" factors involved in rural non-agricultural activities

"Push" factors	"Pull" factors
Population growth.	Labor yields in non-agricultural business are high.
Land scarcity and difficulty accessing fertile land for agricultural production.	Yields engaged in non-agricultural business are high.
Agricultural productivity declined.	The risk of non-agricultural business is lower than that of agricultural activity.
Declining agricultural incomes.	Provide cash to meet the needs of households.
Lack of access to agricultural input markets.	Economic opportunities, often associated with social advantage, can be found in urban centers and outside of the region or country.
Decline of the natural resource base.	The appeal of city life, especially for young people.
Occurrence of temporary events and adverse shocks: droughts, floods, epidemics...	
There is no or lack of access to rural financial markets.	

Source: Davis and Pearce (2000).

The participation of farmers in non-agricultural activities is due to both the "pull" and "push" factors. However, "pull" and "push" relations are only factors that "encourage" the participation of households. In fact, participation in non-agricultural activities also depends on the "ability" factors of farmers, as shown in previous studies.

Kanwal et al. (2016) have shown that low productivity and income from Pakistani agriculture have led rural people to seek alternative livelihoods, especially non-agricultural employment. Similarly, Dontsop-Nguezet et al. (2016) also pointed out that the trend of rural households in South Kivu, Congo, is to include non-agricultural activities in survival strategies and diversify sources of income. Higher income from non-agricultural activities is the main "pull" factor influencing rural households' decisions to join in non-agricultural activities (Liu, 2017).

In addition, Ellis (1993), Ellis (1998), and Tassew (2000) argued that one of the motivations for diversifying income sources into non-agricultural activities is managing risks associated with agricultural production. Imai et al. (2015) also showed that diversifying household activities into the non-agricultural sector will reduce future risks and shocks such as weather shocks, diseases, and macroeconomic downturns (Hare, 1994; Demie & Zeray, 2015).

Another factor that plays an important role in farmers' decisions to participate in non-agricultural activities is the gender of the head of the household. The gender of householders also has a significant impact on non-farm participation, with female householders more likely to engage in self-employed work than men. In contrast, male householders are more likely to engage in employed activities (Hare, 1994; Demie & Zeray, 2015).

Kung and Lee (2001) through the Probit model also showed that education is an important factor in accessing non-agricultural employment. This result is similar to other studies (Imai et al., 2015; Cheng et al., 2018; Do et al., 2022) when explaining that education level has a positive impact on farmers' decisions to participate in non-agricultural activities; the higher the education level, the higher the probability of participating in non-agricultural activities.

The area of farming land is one of the factors that strongly affects the decision of rural households to diversify production activities. The larger the area of farming land, the greater the impact on the decision of farmers to participate in non-agricultural activities. Imai et al. (2015) showed that the more land a household owns, the higher the probability of nonfarm participation. In addition, the larger the area of farming land, the higher the income from non-

agricultural activities (Demie & Zeray, 2015). In contrast, some researchers suggested that the more the area of farming land per capita, the lower the likelihood of receiving non-agricultural jobs (Van et al., 2010; Cheng et al., 2018).

Access to information is also a key factor in the decision of rural households to participate in production activities. Households in different areas are likely to engage in different non-agricultural activities due to differences in socio-economic conditions (Davis & Pearce, 2000). Dary and Kuunibe (2012) through the Logit model showed that the probability of participating in non-farm activities increases when an individual belongs to an organization. Organizations will be the place to provide reliable information such as microcredit, markets, agricultural extension, etc. to members (Dontsop-Nguezet et al., 2016).

Oseni and Winters (2009) studied the relationship between non-agricultural participation and input costs for agricultural production by farmers. The results showed that the high cost of agricultural activities has pushed farmers to participate in non-agricultural activities to loosen credit constraints. This is consistent with the study of Cuong et al. (2021), that found income from agriculture has not made a difference in investment in cultivation and investment items for livestock such as breeds, feed, and veterinary medicines.

2.2. Analysis framework

Based on the theory of "pull" and "push" factors to participate in non-agricultural activities of rural households, as well as an empirical research overview of factors affecting farmers' decisions to participate in non-agricultural activities, the proposed factors are presented as follows:

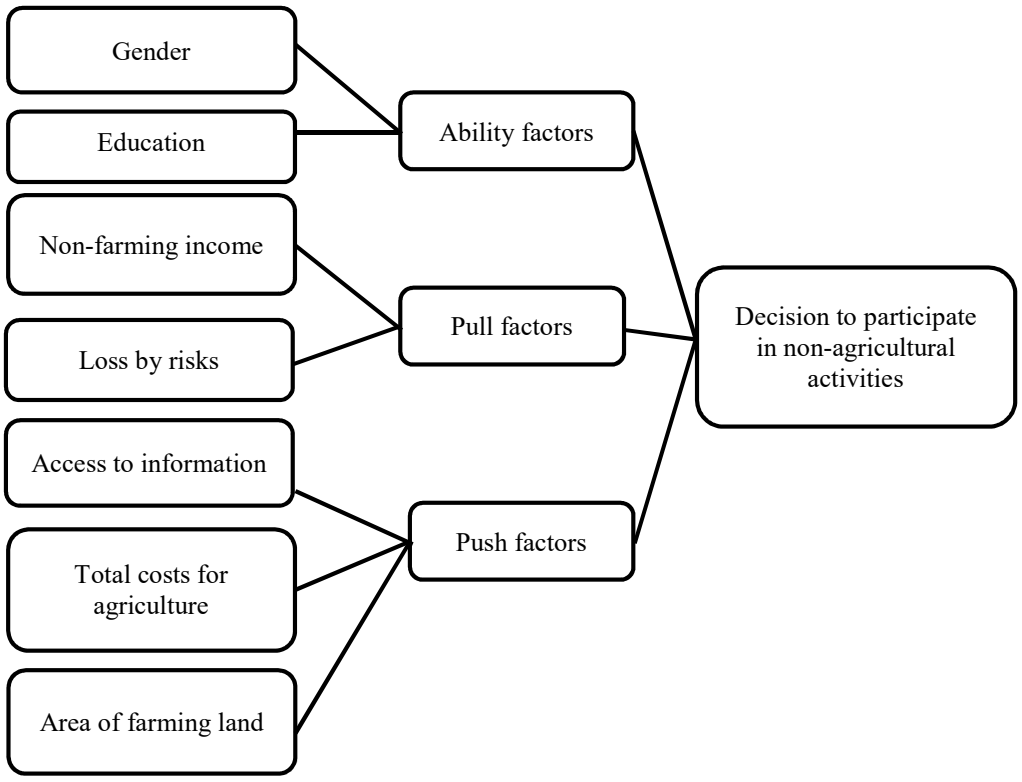

Figure 1: Proposed research model
Source: Authors' own compilation.

2.3. Econometric model

In this research, the authors estimate the factors affecting the decision of rural households to participate in non-agricultural activities in Dien Bien province. This implies that the response variable is whether to participate in

non-agricultural activities of rural households in Dien Bien province.

For the binary or dichotomous dependent variable, the logit or probit model is chosen to do regression analysis, because logit and probit regression models are the frequently used statistical methods for predicting the binary or dichotomous dependent variable. This means that the response of interest can take up only two values – 0 or 1. However, the key difference between the logit and probit models is that the logit model is used to model the odds of success of an event as a function of independent variables, while the probit model is used to determine the likelihood that an item or event will fall into one of a range of categories by estimating the probability that observation with specific features will belong to a particular category.

Therefore, in this study, the authors use the logistic regression analysis approach to estimate the factors affecting the decision of rural households to participate in non-agricultural activities in Dien Bien province.

The study is based on the Logit model (Maddala, 1983). Suppose the linear probability model:

$$y_i = \beta x_i + \varepsilon_i,$$

Where, y_i equal 1 if rural households in Dien Bien province decided to participate in non-agricultural activities; otherwise, y_i equal 0. x_i are the factors affecting households' decision making; $i = 1,...,n$; β is the coefficient of the variables; and ε_i is the random error.

In this research, the authors analyzed the probability (Pr) of each household i randomly drawn from the population and expressed as follows:

$$Pr(y_i \neq 0 \mid x_i) = \frac{\exp(y_i)}{1 + \exp(y_i)}$$

The probability that households decided to participate in non-agricultural activities is,

$$P_i = Pr(y_i = 1 \mid x_i) = Pr(y_i \neq 0 \mid x_i) = \frac{\exp(y_i)}{1 + \exp(y_i)} = \frac{1}{1 + \exp(-y_i)}$$

The probability for undecided households to engage in non-agricultural activity is,

$$1 - P_i = \frac{1}{1 + \exp(y_i)}$$

Therefore

$$\frac{P_i}{1 - P_i} = \frac{1 + \exp(y_i)}{1 + \exp(-y_i)} = e^{y_i}$$

Natural logarithm,

$$\mathrm{L}_i = \mathrm{Ln}\left(\frac{P_i}{1 - P_i}\right) = y_i$$

This equation can be replaced with the following formula:

$\mathrm{L(Y_x)} = \mathrm{Ln}\ \frac{y_{(x)}}{1-y(x)}) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$

In which:

$X_1, X_2, \ldots, X_n$: Independent variables affecting the dependent variable Y(x)

β_0: Value of Y when x = 0

$\beta_1, \beta_2, \ldots, \beta_n$: Coefficient of variables $X_1 X_2, \ldots, X_n$

3. Results and discussion

3.1. Summary statistics

The authors used the Vietnam Access to Resources Household Survey (VARHS) 2016 dataset information from the General Statistics Office source to carry out research. The VARHS dataset was implemented to understand the behavior, opportunities, and obstacles faced by Vietnamese households. The General Statistics Office of Vietnam launched the regular bi-annual VARHS across 12 provinces in Vietnam. The VARHS 2016 dataset covered 2,669 households in rural areas of Vietnam in 2016. However, this research only used 312 households in Dien Bien province for analysis.

The statistical results showed that, although the surveyed households said that the head of household is predominantly female, the average value of the gender of householder participating in non-agricultural activities is lower than that of not participating in non-agricultural activities. This means that households with male householders tend to engage in non-agricultural activities.

The average years of schooling of the household head is only 4.557692 years, which means that primary school has not been completed. Limited educational attainment is

very common in rural areas in Dien Bien province. The relationship between participating and non-participating groups also showed that there was no clear difference between the education levels of householders of the two groups, which were low.

Table 2: Summary statistics

Variables	Mean		
	Whole sample	Participating households	Non-participating households
Gender (Female = 1, Male = 0)	0.820513	0.761905	0.835341
Education (year)	4.557692	4.15873	4.658635
Area of farming land (m2)	806.7564	710.2222	831.1807
Non-farming income (1000 VND)	58409.76	269778.1	4931.02
Total costs for agriculture (1000 VND)	3397.776	4286.46	3172.928
Loss by risks (1000 VND)	2509.01	2833.508	2426.908
Access to information (Yes = 1, No = 0)	0.971154	0.936508	0.97992

Source: Calculation from VARHS 2016.

The average area of farming land of the participating group is significantly lower than that of the non-participating group. In the group of participating households, the average area of farming land is 710.2222 m2, while this figure in the non-participating group is 831,1807 m2.

However, the average non-farming income of participating households showed a significant outperformance compared to non-agricultural households. Participating households recorded an average income of VND 269,778.1 million, nearly 5 times higher than the sample mean. Participation in non-agricultural activities brings high economic value to rural households in Dien Bien. Therefore, there is also a difference in the total expenditure on agriculture between participating and non-participating households in non-agricultural activities. Non-agricultural households have higher spending on agricultural production, with an average expenditure of VND 4,286.46 million.

The results showed that 88.89% of households participated chiefly in manufacturing and processing industries. This is the sector that attracts the greatest participation for households in the rural area of Dien Bien, of which, 82.54% are engaged in producing beverages.

Table 3: Factors affecting the decision of rural households to participate in non-agricultural activities in Dien Bien province

	Logit model		Marginal effects	
Variable	Coef.	Std. Err.	Coef.	Std. Err.
Gender	-0.941*	0.5175	-0.1077*	0.0616
Years of schooling	-0.041	0.0459	-0.0043	0.0048
Area of farming land	-0.391**	0.1888	-0.0411**	0.0192
Non-farming income	0.5496***	0.1008	0.0577***	0.0088
Total costs for agriculture	0.4104**	0.2031	0.0431**	0.0207
Loss by risks	0.2615***	0.056	0.0275***	0.0049
Access to information	-2.3017**	1.173	-0.2807**	0.1437
_Cons	-4.3175	2.0073		
Log likelihood = -101.5821				
Prob > chi2 = 0.0000				
Pseudo R2 = 0.3528				

Notes: *, **, and *** mean for significance at the 10%, 5%, and 1% level, respectively.
Source: Author's calculations.

3.2. Logit regression results

The estimated coefficients of parameters and the marginal effects in the logit model are summarized. The result shows that except for education, measured by the "years of schooling" variable, the remaining variables are significant at the 10%, 5%, and 1% levels.

It is also revealed from the findings that access to information has the greatest impact on households' decisions to participate in non-agricultural activities. When one more household has access to information, the total number of households participating in non-agricultural activities will decrease by 28.07%, holding other variables unchanged. This result is inconsistent with the previous studies (Dary & Kuunibe, 2012; Dontsop-Nguezet et al., 2016). It can easily be explained that the sources of information farmers have access to are mainly agricultural development organizations and relatives, friends and neighbors. The information that agricultural development organizations provide is mainly agricultural extension information and access to credit for agricultural production activities, etc. In addition, the speed of information transmission of relatives, friends, and neighbors is very fast and there is great trust in rural society. Therefore, households will be hesitant in deciding to participate in non-agricultural activities when accessing more information about agricultural production.

Besides, all other variables are held constant; if the head of household is female, the probability of participating in non-agricultural activities is lower than that of the male householder. A possible explanation is that households are mainly involved in the manufacturing and processing industries, which require more male labor; on the contrary, women tend to be more involved in wholesale and retail jobs.

Furthermore, if households have a large area of farming land, the trend to engage in non-agricultural activities decreases. The reason is that increasing the size of farming land, specializing in agricultural production facilitates investment in the application of science and technology according to concentrated production areas, increasing productivity, product quality and increasing income for people.

Furthermore, the higher the nonfarming income, the higher the probability of households deciding to participate in non-agricultural activities. In contrast, an increase in the total costs for agriculture increases the possibility to participate in non-agricultural activities. When the input costs for agriculture increase, it will create an additional financial burden on the agricultural production activities of farmers. Therefore, households will seek diversification in production to increase incomes and improve the quality of life. Similarly, the greater the losses from agricultural production, the less interested farmers are in agriculture, promoting participation in non-agricultural activities. It was also indicated that loss by risks also has a positive effect on households' decisions to engage in non-agricultural activities. This result is consistent with the research of Reardon (1998) and Davis and Pearce (2000) that participation in the non-agricultural sector minimizes uncertainties compared to the agricultural sector. In fact, the loss by risks discussed include natural risks and economic risks. In recent years, climate change has strongly impacted agricultural production across the country. The geographical conditions of Dien Bien province are subject to many natural risks with natural disasters such as thunderstorms, pipe floods, flash floods, landslides, and droughts, appearing frequently and continuously with greater intensity. Recently, pandemics have become more and more complicated and difficult to control; such as: pests destroying crops, avian influenza and the Covid-19 pandemic. All have severely affected productivity and quality, and caused restrictions on the production and trade of agricultural products. It can be said that if natural risks are increasingly occurring with greater frequency and high intensity, it is difficult for people to cope both materially and mentally when only maintaining agricultural activities. The results are similar with the studies of Ellis, (1993), Ellis (1998), Ellis (2000), Kijima et al. (2006), Demie and Zeray (2015), Imai et al. (2015). For non-natural risks such as economic risks: agricultural products depreciate in the market, the price of input materials for agricultural activities fluctuates, and the economic efficiency from agricultural activities is not high. These are also the causes that seriously affect agricultural activities. Therefore,

the smaller the losses from non-agricultural production, the less interested farmers are in agriculture, pulling farmers towards participation in non-agricultural activities.

On the other hand, the years of schooling variable is not significant in the logit regression model. It can be explained that the education level of farm householders in Dien Bien province is relatively low, at a mean of 4.6 years of schooling. Also, there is not a big disparity between participation and non-participation groups in non-agricultural activities. This implies that education has not played an important part in the decision to engage in rural non-agriculture in Dien Bien province.

4. Some solutions to promote non-agricultural activities in Dien Bien province

4.1. Orientation of Dien Bien province

Based on the inherent advantages and potentials of the province, Dien Bien has determined the general objective by 2025 is to bring Dien Bien province to develop fast and sustainably. Therefore, the province is focusing on exploiting the potential and advantages of the locality for economic development. In particular, the province has the goal of turning tourism into a spearhead economic sector, with three main pillars: spiritual-historical tourism, cultural tourism associated with experiences, and tourism of resort and recreational sports.

In addition, in order to promote the development of rural areas in Dien Bien province, the Provincial People's Committee issued Decision No. 375/QD-UBND dated 23/3/2021 on the approval the industrial promotion program of Dien Bien over the period 2021-2025. The province has listed the following objectives: (1) Restructuring the rural economy towards industrialization and modernization based on mobilizing and effectively using all resources; (2) Supporting the development of typical industrial products; (3) Encouraging the transfer and application of scientific and technological advances towards sustainable development; (4) Creating favorable conditions for all individuals and organizations to invest in sustainable industrial development.

From that, combined with the research results, the authors propose some solutions to promote non-agricultural activities in Dien Bien rural areas as follows:

4.2. Solutions for authorities

Firstly, the practice has shown that the geographical location creates favorable conditions for Dien Bien to develop an inter-provincial economy as well as the border gate economy. Therefore, Dien Bien's identification and mobilization of all investment resources for infrastructure are necessary to promote rural economic development. Good infrastructure not only improves production capacity but also helps to cope with natural disasters; at the same time, it helps the province attract foreign investment capital. Besides, information and communication infrastructure also need to be focused on, because the source of information that rural households in Dien Bien have access to is mainly from agricultural development organizations, and relatives, friends and neighbors. The role of the internet and newspapers needs to be promoted so that people can promptly update information from the central to local levels, especially information on promoting non-agricultural economic development such as industrial promotion information.

Secondly, the capacity of managers at all authorities should be enhanced to meet industrial promotion policy requirements. The teams working on industrial promotion and the owners of rural industrial establishments need to strengthen their professional expertise through training and learning from the experiences of other localities such as Bac Ninh in the implementation and management of industrial promotion. In addition, managers must be those who master guidelines and policies, know how to organize implementation, and are dedicated and enthusiastic. They need to have a direct understanding of the local situation, grasping the psychology and desire of local people to apply the policy most appropriately and effectively. This is a key factor in the case of the low education level of rural people.

Thirdly, there should be strengthening and renewing communication on diversifying production and business activities and non-

agricultural business employment, in order to change farmers' perceptions, helping them understand the role of non-agricultural activities in rural areas. Recognizing the importance of rural non-agricultural activities, people will actively participate in non-agricultural activities during idle farming periods, promoting community participation and development. Furthermore, it is extremely necessary to universalize education for all people, enabling them to know reading and writing through short-term classes deployed weekly at local facilities.

Fourthly, coordination with other organizations such as agricultural development organizations should be strengthened in order to implement industrial promotion programs quickly.

Fifthly, there should be quick implementation of the application of scientific and technological advances to production in rural areas. The government will be the "bridge" to promote this activity in the fastest way. The result will be both increases in production value and achievement of the sustainable development goals of the whole province.

4.3. Solutions for local people

An important concern is that households must create conditions for their children to have the opportunity to go to school. The education of Dien Bien householders does not make a difference in the decision to participate in non-agricultural activities, but a high level of education will make a difference in non-agricultural business results. Moreover, households must also strengthen other soft skills to meet the quality requirements of tourism human resources in the context of internationalization and deep integration.

Another problem is that households should access financial sources and external resources to expand their own production. The investment of households in non-agricultural activities is relatively large; mainly self-production and business activities in processing and manufacturing. However, investment capital can create a huge difference among households, which means that the scale of production is uneven between households, creating uneven development.

5. Conclusion

This paper investigates the factors affecting the decision of rural households to participate in non-agricultural activities in Dien Bien province. Using a dataset of 312 households in Dien Bien province, the authors find that the decision to engage in non-agricultural activities in rural areas of Dien Bien province depends on the gender of householders (the ability to participate), nonfarming income and the loss by risks (the main "pull" factor), the area of farming land, access to information, and the total costs for agriculture ("push" factors). The results of the Logit model reveal that education is not a significant variable, while it is an important factor in other studies.

Hence, based on the above results, as well as the orientation of Dien Bien province, the authors suggest some important solutions. The issues to be solved belong to two actors, including authorities and local people. Households themselves must exploit and take advantage of available potentials, along with the support of the State and local authorities to - improve their livelihoods as well as contribute to promoting the overall development of the locality.

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