
Determinants of income diversification among farm households in Thailand

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Abstract The research finding indicated that the age and education level of the household head, the household size, household members migrating for domestic and overseas work, the amount of household debt in the informal sector, and household members' access to credit significantly and positively affected income diversification among farm households in Thailand. The household dependency ratio, annual household income per capita, and the household's land size were found to be significantly and negatively associated with income diversification. In contrast, the sex of the household head, the amount of household debt in the formal sector, and the location of residence were not significant factors in determining income diversification. These results indicated specific factors determining income diversification, enabling policymakers to understand household resources, conditions, and social barriers. Such understanding allowed the policymaker to enhance participation in income diversification strategies in an informed and effective way.

Keywords: Income diversification, Farm households, The Simpson index of diversity

Introduction

Farming is often considered a volatile form of income, vulnerable to risk factors such as inclement weather, market and agricultural commodity price volatility, natural disasters, and seasonality (Mishra *et al.*, 2010). These results affect the uncertainty of income and the need for decision-making and cultivation planning in farm households (Davis, 2001; Davis and Bezemer, 2004; Mishra *et al.*, 2010). Significant factors influencing the level of income of farm households are closely related to households' initial endowments and characteristics, such as household economic status, size of land, cultivation area, agricultural skills and experiences, adaptation to response uncertainties, and the adoption of modern agricultural technology to increase production efficiency (Kingnetr and Maneechak, 2019). Consequently, one of the strategies

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for survival is household income diversification (Davis, 2001; Etea *et al.*, 2020). This strategy provides a pathway of subsistence in which farm households can tackle these risks and uncertainties by accumulating income and wealth and enhancing living standards (Akinrinde *et al.*, 2018; Etea *et al.*, 2020).

Over the past few decades, the issue of household income diversification among farm and rural households has become increasingly prominent in literature and policymaking, especially in developing countries (Davis, 2001; Ersado, 2006; Reardon *et al.*, 2006). That is due to policymakers emphasizing income diversification as a strategy to reduce poverty and drive economic growth in the country (Loison and Bignebat, 2017). In developing countries, especially South Asia, farm households attempted to diversify their income in response to local economic growth and development. It is called a 'demand-pull diversification' (Haggblade *et al.*, 2002). In some contexts, households attempted to diversify their income in a reactionary response to decreased income and value-adding of agricultural products. The momentum is called a 'distress-push diversification' (Davis and Bezemer, 2004).

The objective was empirically investigated the factors affecting the income diversification of farm households in Thailand, to understand the household characteristics, push and pull factors to determine the income diversification.

Materials and methods

Source of data and sample frame

The study employed secondary data from the 2021 Household Socioeconomic Survey (Whole Kingdom) collected by the National Statistical Office (NSO) (2022). Data were collected from January 2021 to December 2021. The research instrument consisted of two main parts: (i) the household income survey and (ii) the household expenditure survey. The interview conducted by the NSO were collected from households in 12 months in a retrospective period before an interviewing month. For instance, the interviewing month was February 2021. The obtained data from the interview referred to household data from February 2020 to January 2021. Household samples were selected by stratified two-stage sampling. The provinces and Bangkok Metropolitan were considered 77 strata, and each stratum (except Bangkok Metropolitan) was divided into two sub-strata: municipal and non-municipal.

The household samples in this study were farm households according to the household socioeconomic status classification of the NSO. In this study, farm households referred to three main groups of households, namely: (i) households engaged in farming, cultivation, animal husbandry, and aquaculture (mostly land owners), (ii) households engaged in farming, cultivation, animal husbandry and aquaculture (tenants or habitants earning a living on the land provide for free mostly), and (iii) households engaged in fishing, forestry, hunting, foraging, and agricultural services. The total of selected farm households was 16,133 households.

Variables

The dependent variable was the level of household income diversification measured by the Simpson Index of Diversity (SID). The sources of household income were classified into two primary sources: agricultural income and non-agricultural income. Agricultural income consisted of four primary sources; namely, (i) income from leasing working animals and agriculture tools, or agricultural service and animal husbandry service, (ii) income from planting and forestry, (iii) income from animal husbandry, and (iv) income from aquaculture, fishery, hunting, and foraging. Non-agricultural income consisted of five primary sources: (i) non-agricultural wages and salaries, (ii) employee benefits and welfare, (iii) non-agricultural income from business and industry, (iv) remittances of household members, and (v) income from other non-employment sources. The SID can be calculated as follows (Adem and Tesafa, 2020):

$$SID = 1 - \sum_{i=1}^n P_i^2$$

or

$$SID = 1 - \left[\left(\frac{INC1}{Tot} \right)^2 + \left(\frac{INC2}{Tot} \right)^2 + \left(\frac{INC3}{Tot} \right)^2 + \left(\frac{INC4}{Tot} \right)^2 + \left(\frac{INC5}{Tot} \right)^2 + \left(\frac{INC6}{Tot} \right)^2 + \left(\frac{INC7}{Tot} \right)^2 + \left(\frac{INC8}{Tot} \right)^2 + \left(\frac{INC9}{Tot} \right)^2 \right]$$

Where: INC1 is income from leasing working animals and agriculture tools, or agricultural service and animal husbandry service, INC2 is income from planting and forestry, INC3 is income from animal husbandry, INC4 is income from aquaculture, fishery, hunting, and foraging, INC5 is non-agricultural wages and salaries, INC6 is employee benefits and welfare, INC7 is non-agricultural income from business and industry, INC8 is remittances of household members, INC9 is income from other non-employment sources,

TOT is the sum of household income from all sources, N is the number of income sources, and P_i is the proportion of income from the source i.

The SID index ranges from 0 to 1. The SID at '1' indicates complete income diversification, whereas the SID at '0' indicates that the farm household has a single source of income or is an undiversified household. To interpret the level of SID, the calculated SID can be categorized into three levels by adopting the criteria of Saha and Bahal (2010) as follows:

Simpson Index of Diversity (SID)	Interpretation
More than 0.62	Highly diverse
0.38-0.62	Moderately diverse
Less than 0.38	Lowly diverse

Independent variables presented household characteristics regarding household push and pull diversification factors. Fourteen independent variables consisted of the sex of the head of household, age of the head of household, level of education of the head of household, household size, household dependency ratio, household members migrating for domestic work and overseas works, annual household income per capita, size of land, the amount of household debt in formal and informal sectors, access to credit, household residence zone (urban/municipal and rural/non-municipal), and region (Central, North, Northeast, and South of Thailand).

Results

The situation of the level of income diversification in farm households in Thailand

An analysis of household income diversification in Thailand using SID found that 47.34% of farm households had a moderate level of household income diversification, followed by low and high levels of household income diversification, at 34.22% and 18.44%, respectively (Table 1).

Table 1. The situation of income diversification among farm households in Thailand

The Simpson Index of Diversity (SID)	Frequency	Percentage
More than 0.62	2,974	18.44
0.38-0.62	7,638	47.34
Less than 0.38	5,521	34.22

Table 2. Determinants of income diversification of Thai farm households in Thailand using the Tobit regression analysis

Independent variables	Coefficient	SE	t	p
Female household head (dummy)	0.005	0.003	1.58	.114
Age of household head (unit: years)	0.001	0.0002	6.64	<.001
Education of head household (Ref.=non-educated)				
▪ Primary				
▪ Lower secondary	0.015	0.007	2.06	.039
▪ Upper secondary	0.016	0.009	1.81	.070
▪ Higher than upper secondary	0.031	0.009	3.62	<.001
	0.028	0.010	2.77	.006
Household size (unit: persons)	0.021	0.001	19.27	<.001
Household dependency ratio	-0.031	0.005	-6.60	<.001
Household members migrating for domestic work (dummy)	0.187	0.004	44.40	<.001
Household members migrating for overseas work (dummy)	0.146	0.012	12.24	<.001
Annual household income per capita (unit: one thousand Baht)	-0.012	0.001	-12.79	<.001
Size of land (unit: ten raises)	-0.007	0.001	-10.79	<.001
Amount of debt in the formal sector (unit: one million Baht)	-0.002	0.003	-0.86	.389
Amount of debt in the informal sector (unit: one million Baht)	0.105	0.018	5.79	<.001
Access to credit (dummy)	0.013	0.006	2.17	.030
Household located in urban/municipal area (dummy)	0.0001	0.003	0.04	.968
Region (Ref.=Central)				
▪ North	0.082	0.005	16.94	<.001
▪ Northeast	0.118	0.004	26.79	<.001
▪ South	-0.002	0.005	-0.32	.747
Constant	0.211	0.015	13.66	<.001
Likelihood Ratio (LR) Chi-Square (p-value)		4532.99 (<.001)		

SE = Standard error

Ref.=reference group for dummy variables

Determinants of income diversification in farm households in Thailand

The finding based on the Tobit regression analysis with the maximum likelihood estimation is shown in Table 2. The result indicated that the age and education level of the head of the household, the household size, household members migrating for domestic and oversea work, the amount of household debt in the informal sector, and household members' access to credit had positive and significant effects on income diversification among farm households in Thailand. In addition, the dependency ratio of households, the amount of annual household income per capita, and the size of the household's

land negatively and significantly affected income diversification. However, the sex of the household head, the amount of household debt in the formal sector, and the residence location were not significantly related to income diversification among Thai farm households. In addition, the finding revealed that households in the north and northeast regions had higher household income diversity than those in the central region. However, the levels of income diversification in the central and the south of Thailand were not significantly different.

Discussion

Sex of household head

The sex of the head of the household was not significantly related to income diversification among farm households in Thailand. The finding contradicts the previous findings of Adem and Tesafa (2020) and Maniriho and Nilsson (2018), who reported that male household heads produced higher diversity of household income than female household heads. It could be due to cultural and social differences, indicating gender equality in household decision-making in Thai contexts.

Age of household head

The age of the household head was significantly and positively related to the income diversification of farm households in Thailand. The finding was consistent with studies conducted by Akinrinde *et al.* (2018). The age of the household head reflected the accumulated experiences and capacities in decision-making related to household economic activities. Thus, older household heads might be more likely to diversify income to build household protection against financial shocks or household crises.

Education level of household head

The education level of household heads was significantly related to income diversification among farm households in Thailand. The result was consistent with previous research by Aababbo and Sawore (2016), Adem and Tesafa (2020), Etea *et al.* (2020), and Wan *et al.* (2016). Household heads with a higher education level might be more likely to expose their households to more significant opportunities due to increased knowledge of alternative income sources. Etea *et al.* (2020) indicated that farmers did not instinctively

develop household income diversification; instead, it must be developed through education and informed decision-making. The better-educated household head was likely to be more aware of household opportunities and potential, as well as more risk-averse and focused on long-term benefits. Thus, household heads with a higher educational opportunity might produce greater income diversity in both on-farm and off-farm activities.

Household size

Household size had a positive and significant effect on household income diversification. The result was consistent with the finding of Etea *et al.* (2020) and Wan *et al.* (2016). Etea *et al.* (2020) explained that a large household size increased household consumption demand, consequently requiring a higher income. Thus, household income diversification was a crucial strategy to cope with higher expenditures from increased household size. In addition, the larger household size might have an excessive labor supply which could be utilized for generating other income sources. In addition, Wan *et al.* (2016) found that an increase in household size resulted in a decline in the marginal product of household labor in agricultural production. Consequently, the household was likely to decide to find other income sources from off-farm activities or other sources.

Household dependency ratio

The household dependency ratio was found to be significantly and negatively related to household income diversification. The finding was consistent with the study of Wan *et al.* (2016), indicating that households with a high proportion of children and older persons were likely to have a lower number of income sources. The household dependency ratio reflected the number of economically active households and the opportunity for household members to participate in the labor market. The household with a higher dependency ratio was more likely to have less economically active household members engaging in both on-farm and off-farm economic activities.

Household members migrating for domestic work and oversea work

These two variables were significantly and positively related to household income diversification among farm households in the Thai context. These significant and positive factors were consistent with findings by Loison and Bignebat (2017), indicating that households having members migrating for

work in the capital or main cities and overseas played an essential role in diversifying household income. In addition, Loison and Bignebat (2017) explained that farm households with members who migrated for domestic work in metropolitan or major cities, particularly during the off-season, the drought season, or natural disasters, increased income diversification. Migration for work was a dominant factor pushing members of farm households to find income to offset the lost income of unemployment. Seasonal migration to work in Bangkok or major cities in Thailand was primarily considered an off-farm income source. In addition, income inadequacy often influenced family members to work abroad to support their families and create economic wealth through remittances. Thus, remittances from household member migration were considered a survival strategy for generating more income, especially in households located in poor economic environments.

Annual household income per capita

Annual household income per capita negatively and significantly influenced household income diversity. The finding was consistent with the result of Agyeman *et al.* (2014), indicating that household income per capita had a negative relationship with the degree of household income diversification. More economically affluent households were presumed to have a lower impetus for income diversity than poor households. In other words, poor households might need to diversify their income to meet their household consumption needs. However, poor households often faced relatively-low resources in their households, and farm productivity was found to be lower. Consequently, poor households were driven to diversify their household incomes to smooth their household consumption. However, this finding was consistent with the direction of the land size variable, which represented household wealth as explained by the concept of distress push diversification (Reardon *et al.*, 2006). Therefore, wealthier farm households seemed less motivated to diversify household income.

Size of land

The land size negatively and significantly affected the income diversification among farm households in Thailand. The result was consistent with the study of Aababbo and Sawore (2016), indicating that the greater the land the households occupied, the more likely that sources of household income declined. As explained by Aababbo and Sawore (2016), households with high land areas might be more specialized in only a single pattern of agricultural

production or engaged in agricultural activities that were perceived as a specialist in the field. In addition, the land size also reflected the higher economic wealth of the households whose perceived need for household income diversity is limited to the moderate level (Reardon *et al.*, 2006).

Household debt in formal and informal sectors

The amount of household debt in the formal sector was not found to be significantly related to household income diversification. Interestingly, the finding revealed that the amount of household debt in the informal sector positively and significantly influenced household income diversification. Household debt was one negative economic stimulus that could contribute to distress-push diversification, leading the household's efforts to diversify their household incomes to cover their household income adequately (Davis and Bezemer, 2004; Loison and Bignebat. 2017). However, this study found that household debt in the formal sector did not affect farm households' efforts to diversify incomes. It is perhaps because debt in the formal sectors in Thailand was subject to payment at a reasonable interest rate. Therefore, it might not cause high pressure for farm households to find higher incomes. Meanwhile, the rising amount of informal loans might pressure farm households to diversify their incomes due to the relatively high-interest rate. In addition, informal debtors were often found in people earning unstable incomes who could not find or borrow money from institutional loan sources. Consequently, they bore the burden of high-interest rates. The informal loan was perceived as a significant negative factor causing households to diversify their income to manage household debt problems and to secure the households from being caught in the vicious cycle of poverty.

Access to credit

Access to credit significantly and positively affected income diversification among Thai farm households. Farm households with potential access to credit were found to be more likely to diversify their household incomes than households facing limitations on funding access. The significant finding was consistent with the study of Adem and Tesafa (2020), Etea *et al.* (2020), and Maniriho and Nilsson (2018). Access to credit markets significantly increased opportunities for income diversification, especially in non-farm activities. It also increased the opportunity for agricultural productivity and the start-up and expansion of business in both agricultural and non-agricultural activities.

Location of residence

Location of residence was not found to be significantly related to household income diversification in the Thai context. The finding was inconsistent with the study of Maniriho and Nilsson (2018), who found that urbanization positively influenced livelihood diversification in Rwanda. This disparity was because the rural farm household in Thailand could access the same variety of income sources in non-agricultural activities as the urban farm households. In addition, the logistics and transportation between rural and urban areas in every part of Thailand were convenient and serviceable, increasing the opportunity to participate in non-farm economic activities.

Region

The region was found to be significantly related to income diversification among farm households in Thailand. The findings showed that households in the north and northeast regions had higher household income diversity than those in the central region. However, the level of household income diversification between households in the central and the south of Thailand was not significantly different. The finding was consistent with the study of Loison and Bignebat (2017) in the context of Senegal and Kenya, indicating that households situated in different economic and natural environments affected distress-push and demand-pull diversification differently. In Thai contexts, every region was distinguishedly different regarding social, economic, and natural endowments and environments, leading to the opportunity and the likelihood of diversifying income sources among farm households.

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