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THE IMPACT OF LIVELIHOOD ASSETS ON THE INCOME AND ENVIRONMENTAL AWARENESS OF HOUSEHOLD TOURISM IN SOUTHWEST VIETNAM

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Abstract: The research explores the relationship between livelihood assets (human, natural, financial, physical, and social) and livelihood outcomes such as income and environmental awareness (EA) in household tourism in the Mekong Delta. The research employed quantitative and qualitative approaches, and samples were collected through questionnaires from household-scale tourism businesses in five districts of Can Tho province using a simple random sampling method. The partial least squares structural equation modelling (PLS-SEM) is applied to analyze the cause-and-effect relationships between livelihood assets and outcome variables. The findings reveal that "Social assets" has the most significant positive impact on household tourism income, while "Physical assets" notably enhance EA. "Human assets" also play a crucial role in income generation, while "Financial assets" and "Natural assets" have a minimal influence on these outcomes. The study suggests that strengthening social networks, investing in eco-friendly physical assets, and enhancing human assets through training and development can promote sustainable household tourism. Significantly, it is recommended that future research refine the sustainable livelihood framework (SLF) model by incorporating external factors like policies, institutions, and community dynamics to capture the complexities of household tourism better.

Keywords: sustainable livelihood; environmental awareness; household tourism; Vietnam

1. Introduction

Sustainable livelihood plays a vital role in eliminating poverty and hunger, thus enhancing the economy and bridging the wealth gap in society (Ashley & Carney, 1999; Udoh et al., 2017). According to the research of Chambers (1987), livelihood includes the utility of capabilities, assets, and activities from households and stakeholders to survive, live, and develop. When the resilience ability of a livelihood is high, smallholder families can spring back after being damaged by internal shocks (insufficient skills, information, etc.) or external shocks (catastrophe, epidemic, market volatility, etc.). Therefore, households with high vulnerability in livelihood are recommended to apply sustainability to reduce the possibility of risks and protect them from unexpected events from the outside (Ashley & Carney, 1999).

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According to the United Nations World Tourism Organization (2022), international tourism grew to 1.5 billion arrivals in 2019, with projections reaching 1.8 billion by 2030. Sustainable tourism offers resilient livelihoods, benefiting community prosperity more than traditional models like farming or manufacturing, particularly in resource-rich but financially constrained regions (Bramwell & Lane, 1993; Hardy et al., 2002). The term "household tourism" refers to tourism activities or businesses that are operated by individual households or families, typically on a small scale. The operations are often informal, focusing on providing authentic and personal experiences for tourists (Rahmani et al., 2017). Despite its abundant natural resources, the Mekong Delta's tourism sector remains underdeveloped, attracting only two million visitors annually (Ministry of Culture, Sports and Tourism, 2022). Challenges include a lack of creativity in tourism models, post-COVID-19 labor shortages, and inadequate infrastructure. Additionally, the Vietnam Government policies, like Decision No. 2227/QĐ-TTg (Government of Vietnam, 2016) and Resolution 120 (Government of Vietnam, 2017), focus on developing a tourism sector that adapts to each culture and identity and emphasizes sustainable development toward climate change. Hence, the tourism sector in this region required a solid reevaluation of the relationship between the aforementioned resource merits and the livelihood outcomes alongside environmental efforts, benefiting as an evidence-based recommendation for future strategies. One of studies on sustainable tourism development concentrates on tourism goods and products, marketing plans, and collaboration (Hall et al., 2005). Only a small fraction of studies incorporated quantitative evaluations to examine the connection between household capital and conservation-related endeavors (Kimengsi et al., 2019). This gap hinders policymakers, strategy specialists, and tourist owners, who lack the scientific evidence to build a strategy or amend the policy to enhance livelihoods in the Mekong Delta. Therefore, asset-based measures are considered more suitable to bridge the gaps because they reflect a household's well-being and condition, thus directly linking to the final performance of livelihood outcome (Ansoms & McKay, 2010; Nielsen et al., 2012).

This paper aims to explore the relationship between Department for International Development (DFID) livelihood assets and household tourism income in Southwest Vietnam, providing a holistic insight into the potential and drawbacks of these livelihood models for future development strategies. To achieve this, two objectives are proposed: 1) analyze the influence of five DFID livelihood assets, including natural assets, human assets, financial assets, social assets, and physical assets, on livelihood outcomes (income and environmental awareness) of household tourism; and 2) suggest potential implementations that can improve the livelihood outcome of household tourism in Southwest Vietnam.

2. Literature review

2.1. Sustainable livelihood framework (SLF) and livelihood assets (LA)

Analyzing livelihoods is complex, requiring consideration of both tangible and intangible factors. The Institute of Development Studies (IDS) and the DFID introduced the Sustainable Livelihood Approach (SLA), which focuses on four key elements: resources, strategies, structures, and processes (Krantz, 2001). The DFID framework enhances the livelihood's resilience to external and internal changes by promoting flexibility in different activities and diversifying their livelihood. This method can offer a holistic and systematic view of the causes of poverty and deepen the insight of the relationship. By pointing out the core value of assets

that affect livelihood, the framework considers the impact of structures and processes (policies, laws, social relations, etc.). It implements strategies for people to apply (Krantz, 2001). Therefore, it illustrates the precise picture of the way that people operate and confront their specific contexts (Aazami & Shanazi, 2020; Krantz, 2001; Reed et al., 2013). Livelihood assets (LA) are categorized into five groups: 1) human assets, such as education, skills, and labor, 2) natural assets, including biodiversity, water, and land, 3) social assets, like networks and organizations, 4) financial assets, such as income, credits, and savings, and 5) physical assets, like infrastructure, transportation, and equipment (Chambers, 1987; DFID, 1999; Krantz, 2001). Each asset is assessed using indicators to determine accessibility and availability, offering a comprehensive evaluation of household livelihoods (Udoh et al., 2017).

2.2. The application of SLF on household tourism

Household tourism, managed by individual families with minimal external investment, leverages local resources, such as gardens, landscapes, and traditional activities, to generate income. Agritourism, a form of household tourism, incorporates agricultural elements such as eco-gardens, orchards, and fishponds, boosting income, creating jobs, and alleviating poverty (Hoang, 2015; Phuc, 2020). This form of tourism enhances agricultural value, stimulates domestic demand, and fosters sustainable rural development by diversifying livelihoods for farmers and rural households, which is also a strength of the Mekong Delta region (Shen et al., 2008; Tao & Wall, 2009). Tourism not only utilizes resources to produce goods, but it also enriches visitor experiences, making sustainable livelihood assets essential for household tourism performance. By transitioning from conventional livelihoods, like farm or craft, to tourism models, households create new income streams, from souvenir shops and ecological gardens to culinary destinations, all rooted in their natural and cultural heritage (Aazami & Shanazi, 2008; Anup & Thapa Parajuli, 2014).

Drawing from previous worldwide studies, Ashley and Carney (1999) proved the positive impact of tourism transition on improving the livelihood outcome of Namibian people; however, the study also revealed a negative relationship that occurs in the benefits conflict between environmental issues and the locals, leaving a gap of explanation in the relationship between the based assets, especially the social assets, and the environmental conflict. Additionally, the research of Goodwin (1998) also proved that applying tourism to conventional livelihood has increased income. Yet, it still leads to an unsustainable future for the environment and ecosystem if under an insufficient development strategy. Meanwhile, the application of the SLF to tourism often confronts some challenges following the gaps in research, because it is inherited from the model for the agricultural sector when tourism, a part of the service sector, in general, has a relatively different operating structure from agriculture or industry. Therefore, this raises the question of whether the inheritance of the model from agriculture can indicate the standard of living in terms of tourism sector (Ashley & Carney, 1999; Shen et al., 2008).

Most studies on the SLF and tourism indicated that Vietnam has strong and diverse assets, especially natural and cultural resources. In Lai Chai province, the opportunity to emerge in ethnic culture has aroused a huge curiosity of tourists, leading to more experienced services that significantly enhanced local income compared to conventional agriculture. However, the study has not clarified the causality between the assets and the livelihood outcomes with a valid model, leaving untrustful evidence for building strategies (Nga & Van, 2019). This is also the case with the research of SLF on tourism at the Bu Gia Map National Park. While the author indicated that the

development of tourist activities at the buffer zone could lead to more negative behaviors to maximize the profit, such as deforestation for construction, tourist waste, there are no prove solid validation or examination on the causality between those (Sang & Van, 2020). In the Mekong Delta region, the research on the sustainable livelihood of ethnic minorities in An Giang province was conducted based on the exploration factor analysis (EFA) and ANOVA to assess the relationship between assets and livelihood outcome; however, it lacked the focus on the rank of impact and most the studies the authors of this paper reviewed on the above did not contain, or were specifically aimed at the subjects in household-level, or considered the environmental awareness (EA) as a livelihood outcome (Lê & Trần, 2023; Nguyễn Quảng & Nguyễn Văn, 2022).

3. Methodology

3.1. Measuring instruments

The research was carried out in five districts (Ninh Kieu, Cai Rang, Binh Thuy, Thot Not, and Phong Dien) of Can Tho Province, Vietnam (Figure 1). This province is the center of commerce and trade in Southwest Vietnam, where the population is over 1,200,000 (General Statistic Office of Vietnam, 2023).

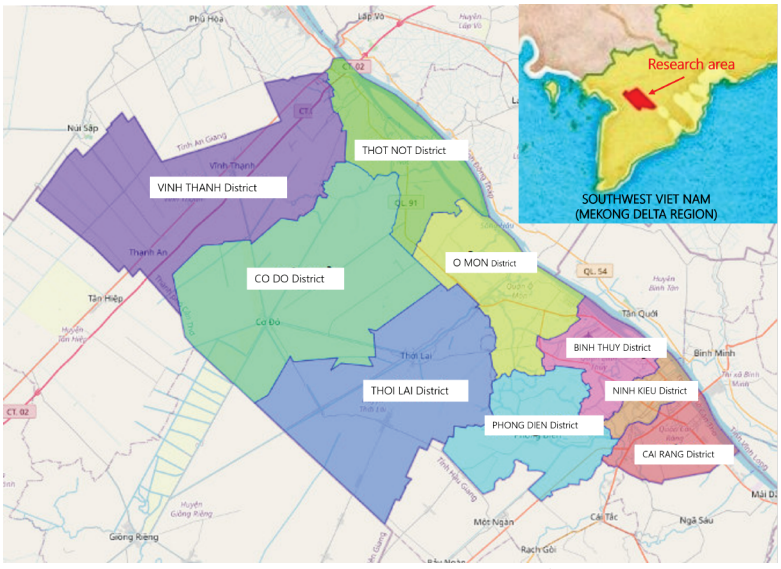

Figure 1. Research area and administrative map of Can Tho province.
Note. Adapted from Administrative map, by the Department of Natural Resources and Environment in Can Tho, Vietnam, 2023. CC BY-NC-ND

A total of 11 items for Assets were collected through a questionnaire and four items for Outcomes were collected with a Likert 5-point scale. These data were presented in Tables 1 and 2.

Table 1. Observed variables in the partial least squares structural equation model (PLS-SEM)

Asset	Item	Variable name	References
Human	N1	Training and skill development	(Angelsen et al., 2011; DFID, 1999; Masud et al., 2016)
	N2	Ensuring the rights and welfare of laborers	
	N3	Local labor recruitment	

Table 1. Observed variables in the partial least squares structural equation model (PLS-SEM) (*continued*)

Asset	Item	Variable name	References
Natural	T1	Tourist area	(DFID, 1999; Tao & Wall, 2009)
	T2	Water consumption per month	
Social	X1	Involvement in local culture and customs	(Tao & Wall, 2009)
	X2	Respecting local culture and customs	
Financial	C1	Tourist revenue in 2022	(Angelsen et al., 2011; Masud et al., 2016; Scoones, 1998)
	C2	Income per month	
Physical	V1	Machinery equipment (fridges, lights, etc.)	(Angelsen et al., 2011; Argaw, 2022)
	V2	Income within a household	

Table 2. Dependent variables representing livelihood outcomes

Outcome	Item	Variable name	References
Income	TN1	Annual income increase compared to before tourism integration	(Argaw, 2022; DFID, 1999; Scoones, 1998)
	TN2	Household savings increase compared to before the tourism integration	
Environmental awareness	MT1	Interest in nature conservation for landscape since tourism integration	(Argaw, 2022; Dang et al., 2020; DFID, 1999)
	MT2	Production of eco-friendly souvenirs	

3.2. Data collection and analysis

A simple random sampling method was applied to the research model through questionnaires and survey questions for each tourist household. Samples were randomly selected from a list of household-scale tourism businesses from the Can Tho Department of Culture, Sports, and Tourism. The data collection process was relatively challenging due to the dispersed nature of household tourism in Can Tho, primarily located in suburban and rural areas with abundant natural resources such as land, forests, water, and rich ecosystems. Traveling to these survey locations was time-consuming, with an average of only 2–3 samples collected per day at most. Additionally, while respondents were generally forthcoming when answering questions about LA, they were less transparent regarding income-related information or financial investments such as loans, often leaving these sensitive details unanswered or inaccurately reported due to personal considerations. Compounding these challenges, research was conducted during the off-season for tourism (from February to April), which may not fully reflect the actual performance of the tourism models.

Notably, this research focuses on the specific subject, household-level tourism models, in Can Tho province, where the total number of cases provided by the provincial Department of Culture, Sports, and Tourism amounts to only about 115 households. Therefore, the entire dataset has been collected to comprehensively represent the area under study. Using other methods, such as the inverse square root or gamma-exponential, typically requires a larger sample size, which is not feasible in this research, where the total number of subjects is specifically determined and cannot be expanded. Although these methods may improve accuracy in estimation, the 10-times rule offers a reasonable solution that balances feasibility, methodological requirements, and the available sample size. Furthermore, this method is widely used in PLS-SEM studies and is highly regarded for its simplicity and effectiveness (Kock & Hadaya, 2018). Based on the study of Hair al. (2014), the 10-fold rule (10 times rule) method is recommended to determine the sample size for the PLS-SEM.

According to the rule, the sample size could be decided between two determinations: 1) Determination through the cause scale with a sample of at least 10 times the number of the observed paths; and 2) Determination via dependent variable, with a minimum sample of 10 times the number of the impact paths (Hair et al., 2014). In this research, the variable "Human assets" has the highest number of observed variables with three variables. Based on method 1, the sample size would be 3 × 10 = 30 (samples). If applying method 2, "Income" and "Environmental awareness" variables are affected by five independent variables, and the number of minimum samples would be 5 × 10 = 50 (samples). Therefore, the study used method 2 with the highest number of samples. The analysis of data was facilitated through the utilization of both Microsoft Excel and the Smart-PLS software.

3.3. Hypotheses development

Previous studies have shown that livelihood assets are inextricably linked to income generation. In the tourism context, better assets (unique landscapes, palatable cuisine, etc.) lead to a superior advantage to attract tourists to come and experience them, whilst a shortage of assets (less diverse activities, underdeveloped accommodation, etc.) could reduce tourists' experience, directly depleting the income and damaging the livelihood of household (Ma et al., 2018; Truong et al., 2014). Therefore, each asset has a specific mechanism impacting the revenue and livelihood quality.

Oberlack et al. (2016) have proven that "Human assets" such as enhanced expertise and professional knowledge of employees could reduce costs, motivating employees to make choices that maximize work-related benefits. For instance, expertise helps people distinguish between products or processes that harm the environment and negate the tourism figure (e.g., pesticides, chemical fertilizers, etc.) (Ma et al., 2018; Perz, 2005). Meanwhile, "Natural assets", such as farms, landscapes, and ecosystems, contribute significantly to increasing the sense of exploration, attracting many tourists, and positively affecting households' tourism income. Preserving the beauty and integrity of a pristine landscape relies on the diligent stewardship and sustainable resource management practices employed by its custodians (Ashley & Carney, 1999; Du et al., 2016). "Social assets" create a positive connection to tourism development by providing the livelihood host with several fundamental and intangible resources that benefit the tourism model with up-to-date information between individuals or groups in the network (relatives, friends, colleagues, etc.), benefiting the information transmission, better material supply contacts, or qualified labor resource (Amato et al., 2018; Gursoy & Rutherford, 2004; Mitra, 2008). Therefore, a livelihood model that received strong social networks with more mutual benefits might be more resilient to the volatility of external shocks. Moreover, collaborating with agencies and third parties will expand market approaches and enhance tourist promotion, thus contributing to the sustainability of tourism as a trend of globalization (Mitra, 2008). The livelihood owners need stable "Financial assets" to establish or develop their livelihood model, such as building accommodations, modifying the landscape, and upgrading facilities within tourist destinations. This investment aims to enhance the tourist experience and encourage increased spending, directly generating revenue. In the context of sustainable development, landscape, and environmental preservation in numerous tourist destinations is increasingly prioritized through green investment (Ma et al., 2018). Finally, "Physical assets", such as advantageous terrain and transportation infrastructure, provide numerous benefits for

enhancing the accessibility of tourists to the tourist destination (Islam et al., 2014; Ma et al., 2018). In addition, material advantages such as products and service technologies are transferred in the orientation of emission mitigation or pollution reduction to improve the landscape at the tourist destination of the tourist households.

Based on the literature review and previous studies associated with the theoretical sustainable livelihood framework of DFID (1999), ten hypotheses (*H*) are proposed as follows:

- H_1: "Human assets" have a positive impact on tourism income;
- H_2: "Human assets" have a positive impact on EA;
- H_3: "Social assets" have a positive impact on tourism income;
- H_4: "Social assets" have a positive impact on EA;
- H_5: "Physical assets" have a positive impact on tourism income;
- H_6: "Physical assets" have a positive impact on EA;
- H_7: "Natural assets" have a positive impact on tourism income;
- H_8: "Natural assets" have a positive impact on EA;
- H_9: "Financial assets" have a positive impact on tourism income;
- H_{10}: "Financial assets" have a positive impact on EA.

4. Results

4.1. Sample demographics and household tourism characteristics

The data in Table 3 indicate that the average age of household heads is around 47. Additionally, there are households where some younger members (around 23 years old) are engaged in family businesses. This suggests that younger generations are still transitioning within the family tourism model. However, these younger households generally lack experience and practical management skills. Furthermore, there are instances where household heads exceeding the retirement age of 70 remain involved in the tourism business. Many tourism models are related to their former livelihoods, such as garden homes or craft villages. Besides, over 70% of the household members are engaged in income-generating activities, indicating a relatively high contribution of members to the household income. In comparison, there are also households where only 25% of members contribute to the income.

Table 3. General characteristics of tourist households

Characteristics	Unit	Mean	SD	Min	Max
Age	Year-old	46.62	11.544	23	78
Household member	Person	3.88	1.409	1	9
Labor percentage	%	70.08	28.414	25	100
Tourism model (experience, cuisine)	Model	1.82	0.748	1	4
Income	Million VND/month	93.50	171.355	5	800

Note. The exchange rate is 23,725 VND/USD; from Ministry of Finance, Vietnam, 06/2023.

Among the six predefined tourism model activities, which include travelling services, food and beverage services, supplementary service provisions, accommodation services, transportation services, and experiential tourism activities, most households engage in more than one type of tourism. The predominant activities are experiential tourism followed by culinary tourism. Having multiple tourism activities within a single model enables households to generate more revenue. These tourism models are often associated with local characteristics such as ecotourism, Mekong Delta cuisine, and various regional attractions,

aiming to showcase identity and diversity. The average monthly income of these household tourists is approximately 3,700 USD. However, this figure is distributed unevenly, with some households earning as much as 29,000–32,000 USD monthly, while others only earn around 200 USD per month. This disparity reflects income inequality within the city of Can Tho. Higher-income households often benefit from social resources such as Tourism Cooperatives or Tourism Alliances, which offer abundant benefits from networking.

Table 4. Distribution of tourist households in Can Tho City according to the result of the survey

No	District	Household	Proportion (%)
1	Ninh Kieu	12	24
2	Cai Rang	3	6
3	Binh Thuy	24	48
4	Thot Not	3	6
5	Phong Dien	8	16
Total		50	100

Table 4 reveals that the surveyed population for the study consists of 50 tourism-oriented households. A significant portion of these households are concentrated in the Binh Thuy district, where 24 households represented 48% of the total. This concentration can be attributed to Binh Thuy's advantages in orchards and its location near the city center. This district is a hub for several tourist destinations, such as the Con Son Tourist Area, Bay Bon Fish Farm, Tin Hoa Flying Fishpond, and 6 Canh Garden. This has positioned Binh Thuy as a significant hub for household tourism in Can Tho province. As for the Thot Not district, household tourism models are primarily located in the Tan Loc Islet area, which is quite distant from the city center, creating challenges for households to improve their tourism models. Notably, most households in Thot Not district have closed their operations after the COVID-19 pandemic.

4.2. Outer model (measurement model) and hypothesis testing

Table 5 summarized the validation metric of the model in the PLS-SEM framework, encompassing factor loadings, composite reliability, and average variance extracted (AVE). The results indicate that all the observed variables exhibit factor loadings greater than the benchmark of .6, indicating strong individual item reliability to the respective construct. Similarly, the composite reliability values for the variables all surpass the threshold (.7), confirming the internal consistency of the variables. Moreover, the model's AVE values exceed the expected threshold of .5 for all variables, reflecting adequate convergent validity across all constructs (Hair et al, 2014). In conclusion, this strong convergent validity is critical for ensuring the robustness of the structural model and the reliability of subsequent path analysis.

Table 5. Results of assessing the reliability and convergence of the scale

Variable	Item	Outer loadings	AVE	Composite reliability
Human assets	N1	.845	.808	.927
	N2	.930		
	N3	.920		
Natural assets	T1	.963	.681	.805
	T2	.661		
Financial assets	C1	.895	.797	.887
	C2	.891		

Table 5. Results of assessing the reliability and convergence of the scale (*continued*)

Variable	Item	Outer loadings	AVE	Composite reliability
Social assets	X1	.944	.866	.928
	X2	.917		
Physical assets	V1	.699	.684	.809
	V2	.938		
Income	TN1	.952	.904	.950
	TN2	.950		
Environmental awareness	MT1	.860	.772	.871
	MT2	.898		

Table 6. Fornell-Lacker criterion

	1	2	3	4	5	6	7
Environmental awareness	.879						
Physical assets	.114	.893					
Human assets	.268	.239	.899				
Income	.189	.466	.441	.951			
Natural assets	.082	.604	.338	.382	.825		
Physical assets	.382	.637	.177	.313	.484	.827	
Social assets	.302	.427	.184	.574	.259	.303	.931

The results from Table 6 demonstrate the discriminant validity of the scale through the Fornell-Lacker criterion, which is not violated. This is evidenced by the square root of the AVE values exceeding the correlations of these constructs with others, ensuring discriminant validity. The R-squared value for "Environmental awareness" is .298, indicating that 29.8% of its variance is explained by the independent variables. Similarly, the R-squared value for "Income" is .483, meaning the independent variables account for 48.3% of its variance.

Table 7. Path coefficient

Path coefficients	Original sample	SD	T statistics	Results
Human assets → Income	.299	.144	2.076*	Accepted H_1
Human assets → EA	.246	.139	1.766**	Accepted H_2
Social assets → Income	.429	.122	3.515*	Accepted H_3
Social assets → EA	.265	.130	2.042*	Accepted H_4
Physical assets → Income	–.020	.153	.133	Denied H_5
Physical assets → EA	.519	.180	2.882*	Accepted H_6
Natural assets → Income	.070	.142	.490	Denied H_7
Natural assets → EA	–.136	.164	.830	Denied H_8
Financial assets → Income	.182	.169	1.076	Denied H_9
Financial asset → EA	–.307	.186	1.647**	Accepted H_{10}

Note. *$p \leq .05$, **$p \leq .1$, Calculated results by SmartPLS from collected data, 2023.

Table 7 presents the results of the PLS-SEM structural model testing. Five hypotheses (H_1, H_2, H_3, H_4, and H_6) were accepted, H_{10} was also accepted but exhibited a negative correlation contrary to expectations, and H_5, H_7, H_8, and H_9 were rejected due to p-values greater than .1, indicating that these relationships are not statistically significant. In detail, the "Human assets" variable positively impacts "Income" (.299) and "Environmental awareness" (.246) at significance levels of less than .05 and .1, respectively. "Social assets" exhibit the strongest positive influence on "Income" (.429) and "Environmental awareness" (.265) at a significant level of .05. "Physical

assets" significantly impact "Environmental awareness" (.519) at the .05 level, but shows no effect on "Income". "Financial assets" negatively affect "Environmental awareness" at a significant level below .1 but does not influence "Income". The "Natural assets" do not impact "Income" or "Environmental awareness", as both relationships yield *p*-values above .1.

5. Discussion

The livelihood situation of tourism business households in Can Tho City has great potential for development in the future. With a relatively high source of income, this may be a trend of shifting the model from conventional agriculture to tourism services. However, more than 40% of households have not yet participated in capacity training in tourist management, which means most household tourism models were built on their desire without standardized tourism governance. Household tourism models have a wide variety of income sources, which helps them avoid risks if one of the sources of livelihood is lost or damaged. Most tourist households develop based on the traditional occupation of other families, often agriculture, such as orchards. Therefore, the transition to tourism can be seen as a combination of purely agricultural and non-agricultural (Chuyên & Thi, 2013), thus boosting income and other livelihood outcomes.

5.1. Human assets

The variable "Human assets" positively impact "Income" and "Environmental awareness", reinforcing Oberlack et al. (2016) research findings that individuals with sufficient experience and labor rights tend to make more informed and beneficial decisions about business models. Additionally, developing human capital enhances awareness of the decisions' environmental impact.

5.2. Social assets

"Social assets" exert the most substantial positive influence on "Income" and a moderate "environmental" impact. Hypotheses H_3 and H_4 are confirmed by Thắng (2007). Approximately 50% of tourist households do not choose one of the three forms of social connection: cooperatives, tourism alliances, and tourist agency connections. This limited connection makes the tourism model more vulnerable to external shocks. Instead of sharing the losses and supporting each other (network members) when problems arise, the model with low social assets will have to face unforeseen shocks solely, which makes them less resilient to devastating crises such as COVID-19. This phenomenon demonstrated that community culture, social connections, and family ties significantly promote livelihoods through information exchange, financial support, and labor assistance. In the context of tourism, social relationships are more emphasized. According to Shen et al. (2008), unlike other types of agriculture, tourism is a service that requires a combination of individuals to build a livelihood image. For agriculture, production (upstream) and consumption (downstream) can exist at the same point. Tourists come to tourism business households; they experience products and services that people grow and create themselves. Therefore, keeping the image is an inevitable solution because if an individual causes a notorious image, it immediately affects the whole tourism model. This explains why these models often build many links with stakeholders around the region to create an image of tourism services.

In addition, tourist households can use each household's unique strengths to set up diverse experiential tours. The more diverse the system, the broader it is and the greater the revenue source will be (Pretty & Wall, 2001; Shen et al., 2008). For example, in Con Son, the formation of clubs by tourism business households helps them limit competition; on the contrary, these households even support each other more in the process of business activities.

5.3. Physical assets

The "Physical assets" variable only impact "Environmental awareness". The alternation from agriculture (smallholder farms, gardens, etc.) and industry (local factory) to tourism, a form of the service sector, has turned the large machines consuming fuel, chemical farming, etc., which cause emissions, into equipment or products that preserve the landscape and promote the experience for tourists. This also requires machines to be adaptable to the ecosystem and nature without any discharge to avoid negative images in front of customers. The case of the Bay Bon fish raft in the Con Son tourism model has the strength of visiting rare fisheries in the Mekong Delta; the application of machinery in the fishponds and food production had to be made less ecologically harmful as much as possible. However, regardless of the positive change, household tourism's small and medium scale remains in the early stages of transitioning from minor to significant changes (Vương, 2015). The case of denied H_5, which meant no impact of "Physical assets" on "Income", can be explained by the fact that the machinery and equipment in household tourism are often small-scale. According to the principle of economies of scale, the quantity is still not large enough to save production costs at an optimal level. More machine operations or eco-friendly products, which are usually more expensive than the conventional ones, also mean more investments and expenses and reduced income (Chương & Hải, 2022).

5.4. Natural assets

The "Natural assets" had no effect on both dependent variables, "Income" and "Environmental awareness". From the indicated items of this asset: 1) area size and 2) water use, the area size (square) variables do not really affect tourism models because households with gardens larger than a few hectares also do not earn more income than tourist households that develop customer satisfaction services. As for assets like water use, households outside Ninh Kieu district (central district) often use more than one water source from the city's water supply plant; most of them have their own water pumps, and some households also have their water filtration systems for business. The measurement of consumer water is inaccurate and showed no impact on the dependent variables. Regarding EA, according to K. Nguyen and A. Nguyen research (2016), the study missed the consideration of ecological and environmental diversification in the model, so the aforementioned variables in the area and the amount of water consumed cannot explain the EA in households and cannot be shown affecting tourism. Since the tourism models examined in this study operate at the household level, measuring natural resources like land can be nuanced. While land size is a factor, the quality of the experiences such as uniqueness and visitor satisfaction, is often more critical in attracting tourists. In Can Tho, conflicts between tourism owners and neighbors over land boundaries and livelihoods often arise, rooted in the difference in the transition decision. Some households remain in conventional agriculture or small-scale production, which rely on more operational or farm waste such as chemical fertilizers or plastic, which can negatively impact the ecosystem

and the landscape of tourism operators. This tension is further complicated by the natural resources the tourist owner took advantage of, often belonging to the community instead of individual ownership (Sang & Van, 2020).

5.5. Financial assets

Finally, the "Financial assets" variable negatively affects "Environmental awareness" and does not influence household income. This can be attributed to the nature of household tourism, where gardens, landscapes, or natural advantages are often inherited from the family rather than financed through bank loans. Furthermore, most households decide to transform to tourism models without formal training in financial management, leaving them unable to build a proper financial strategy or effectively access loans. Combined with the small scale of the household, it is considered that "Financial Assets" create an insignificant impact on the "Income" in this case (Nguyễn Quảng & Nguyễn Văn, 2022). While "Physical assets" foster environmentally aware decisions, such as adopting eco-friendly technologies, providing green amenities, or creating sustainable souvenirs to enhance tourist satisfaction, "Financial assets" often reflect a profit-driven mindset. The financial burden of implementing environmentally sustainable changes, such as adopting green technologies or improving infrastructure, can discourage investment in such initiatives. As a result, household tourism operators may prioritize short-term profits over long-term environmental sustainability. In some cases, this leads to practices like greenwashing, where a superficial appearance of environmental responsibility is maintained to appeal to tourists without making meaningful ecological improvements. This divergence between the roles of physical and financial assets underscores the complexity of achieving both economic and environmental objectives in small-scale tourism models.

6. Conclusion

This study contributes a holistic insight into the relationship between DFID Livelihood Assets, household "Tourism income", and "Environmental awareness", which highlights the vital role of "Social" and "Human assets" in income generation, and "Physical assets" positively contribute to "Environmental awareness". Meanwhile, other assets, such as "Finance" and "Nature", have a negative or no impact on the outcomes. These notable differences stem from the nature of household or family-sized tourism businesses, highlighting the effects of small-scale tourism models on the relationship between assets and outcomes from traditional agricultural livelihoods. Household tourism in the Mekong Delta is closely linked to the community's responsibility, where production and consumption exist simultaneously. The responsibility no longer lies with each individual. Still, it requires the efforts of many households to protect, build, develop, and expand the models through organizational structures, cooperation, and development strategies toward green practices, which not only relieve resources alone but also raises the awareness of participating households and the institutional elements in the region (Shen et al., 2008; Quang & Van, 2022).

Research shows that the SLF method is sufficiently validated for assessing sustainable livelihood models in the Mekong Delta. However, when applied to household tourism, the model requires several adjustments and improvements. The traditional SLF approach, focusing on livelihood assets, does not fully capture the relationship between resources and livelihood outcomes. Since the SLF model is overly centered on the household level, placing household assets at the core, it overlooks equally important external factors such as policies, institutions,

and other non-household elements when analyzing this specific group (Mensah, 2011). Notably, social connections, organizations, and teamwork play a crucial role in shaping livelihood outcomes in small-scale household tourism. Therefore, it is recommended that future research should consider emphasizing community, institutional, social, and policy-related factors on par with livelihood assets to achieve a more accurate assessment (Ashley & Carney, 1999; Mensah, 2011). Additionally, due to natural differences across regions, some near the coast, others in mountainous areas, as well as variations in livelihood practices, ethnic factors, and local policies, expanding research beyond Can Tho to other provinces would provide a more comprehensive and specific evaluation of SLF's application to household tourism in the Mekong Delta.

The following implications are recommended to promote local household tourism livelihood models effectively. First, enhancing "Social assets" is crucial, as expanding networks through local alliances or groups allows tourism owners to share resources, exchange knowledge, and diversify their models. By forming more external relations with partners or third parties, such as travel agencies and tourism companies, household tourism can broaden market reach and strengthen promotion. Secondly, investing in eco-friendly "Physical assets" helps boost "Environmental awareness". For instance, Tram Chim Ecotourism in Dong Thap utilized its unique lotus and crane-rice fields to create organic products and eco-friendly souvenirs while introducing cleaner boats to protect wildlife. Third, creating unique tourism products by leveraging distinctive geography and biodiversity can help differentiate household tourism offerings and attract more visitors. Finally, to improve "Human assets", tourism owners and employees should undergo advanced training or specialized workshops to adapt to innovations and sharpen skills toward future development and collaboration.

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