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Impact of health shocks on household welfare in Viet Nam's Mekong Delta: An exploratory study

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ABSTRACT

The Covid-19 pandemic fundamentally disrupted lives worldwide, leaving significant social and economic consequences. This study examined the extent to which the pandemic affected rural households in the Vietnamese Mekong Delta in two dimensions, encompassing health and economic welfare; and the individual's perception of the Covid-19 seriousness, as well as their coping strategies for this health disaster. Applying the 'One Health' approach, a single cross-sectional sample of 461 rural households was obtained, including information on household demography, productive resources, and Covid-19-related health issues in Tien Giang, Tra Vinh, and Can Tho. The findings are that (1) the Covid-19 pandemic significantly reduced household income while the Covid-19-related health issue was less severe; (2) the state financial support for rural households to mitigate the negative impacts of Covid-19 was marginal and unequal; and (3) the One Health approach attracts considerable attention from rural households. Accordingly, improving skills and knowledge is part of a long-term strategy to promote income extension in this region for economic recovery and preparation for future inevitable health shocks.

1. INTRODUCTION

Economic analysis of the association between health shocks and household income is imperative (Kiely et al., 2023). The Covid-19 pandemic – an unprecedented disease – was not only a health but also economic catastrophes in rural areas. Compared to health problems, the economic consequences of the pandemic are even more considerable in the stage of new normal. Hence, the households' resilience policy should be tailored concerning local conditions (Zhao et al., 2023; Kiely et al., 2023). Mitra et al. (2016) argued that in order to smooth expenditure owing to health shocks, rural families tend to borrow money, sell their properties, and cut their children's education expenditure, that perpetuates the effects of health shocks in the long run. As anticipated, the pandemic has serious repercussions in the Mekong Delta of Viet Nam (VMD), a major agricultural production region, according to The General Statistics Office of Viet Nam (GSO, 2021). Therefore, the lessons learned from the extent to which the local economy has coped with the pandemic and adapted to the new normal are crucial for the country in the preparation for unpredicted events in the future.

This paper aims to investigate how Covid-19 impacted rural households' health and economic activities in VMD.

Specifically, we would like to respond to the three research questions as follows:

1) To what extent did rural households in the VMD protect themselves against the Covid-19 pandemic?

(2) How can state financial support assist rural households in mitigating the negative effects of the Covid-19 pandemic in the VMD?

(3) What was the impact of the Covid-19 pandemic on income levels in the VMD?

To answer these questions, we base our research on the One Health approach, introduced by the World Health Organisation (WHO), which calls for 'the collaborative efforts of multiple disciplines working locally, nationally, and globally, to attain optimal health for people, animals, and our environment. One Health promotes a sustainable and healthy community through collaboration, communication, coordination, and capacity building' (WHO, n.d.). When it comes to the health aspect, we examined individuals' vaccination, their daily sanitation behaviour after the pandemic, their interpretation of One Health. For economic activities, we recorded household income change due to the pandemic, and the state benefits which cushioned the repercussions of Covid-19.

This paper contributes to the literature on the Covid-19 pandemic impacts in Viet Nam in three main ways. First, given the shortage of information on Covid-19 in rural areas, our surveyed data provide comprehensive micro-data on the extent to which rural communities attempted to minimise the cost of the pandemic. Second, analysis of the preparedness for living after the pandemic is vital for getting further insights into the individual behaviour towards unpredictable disasters. In the case of Covid-19, being vaccinated, following advice of hygienic practices, along with consumption on healthcare insurance, evidence the readiness for living in a new normal. Third, modelling economic impacts of Covid-19 pandemic at the household level reinforces an assertion that the economic problems ought to be placed in a central focus for recovering the society in the new normal era.

2. LITERATURE REVIEW

The effects of Covid-19 pandemic exclusively on rural areas, especially in VMD, has been rarely discussed (Franco, 2020). At the very first moment of Covid-19 in Viet Nam, Yang et al. (2020), through a phone survey, found that rural households were very vulnerable to the impacts of Covid-19; 70% of them experienced an income decrease while the poor and ethnic minorities raised a concern about food insecurity if continued social distancing and lockdowns had been in effect.

Nguyen et al. (2024) also confirmed that ethnic groups, workers with frequently physical contacts at work, were more likely to suffer from Covid-19-related income loss. Nguyen and Truong (2021) emphasised a disruption of the global supply chain in agricultural sectors that prevented Vietnamese farmers from selling their produce in the world markets. GSO (2022) reported that in 2022, 10% (app. 500 thousand labourers) of self-employed in the agricultural sectors were impacted by the pandemic. Dao (2023) highlighted difficulties for the Vietnamese farmers in the pandemic. Crop and animal diseases, excessive cost of inputs for agricultural production, in addition to Covid-19-related causes such as expensive travel costs, and market shutdowns exacerbated difficulties of rural economic activities.

While rural households faced with huge challenges due to the pandemic, research on financial assistance from the governments is in its infancy, thereby resulting contentious messages. In addition to improvements in individual well-being, state benefits stimulated household spending on durable goods, increased optimistic outlooks of national economy, enhanced support from the mass for governmental policy in Thailand and Viet Nam (Bui et al. 2022). Yang et al. (2020) showed that most of financial assistance in the pandemic was related to the health insurance subsidies, but the other financial programs were very insignificant. For 10% of households registered for financial help, only one-out-of-ten got beneficiary in 2020.

In short, although Covid-19 has been under control, knowledge of the extent to which the society was influenced and found solutions to overcome its prolonged consequences are of importance. Nevertheless, there are limited studies on Covid-19 pandemic effects on the rural society owing to data unavailability.

3. MATERIALS AND METHOD

3.1. Data collection

Empirical analyses in this paper were facilitated by the dataset collected in 2023 in Tien Giang Province, Tra Vinh Province, and Can Tho City (Figure 1).

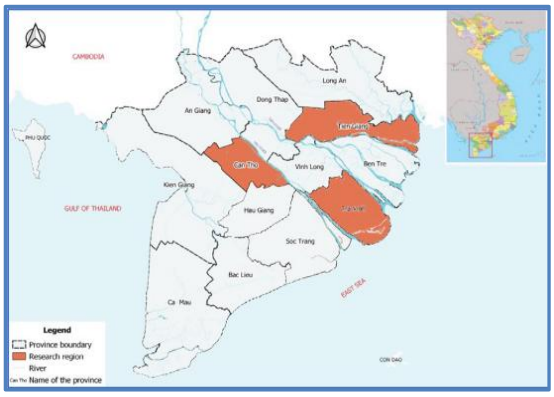

Figure 1. Location of the study areas

(Source: adapting from Dinh et al., 2020)

The sample consists of 461 rural households whose major livelihoods rely on agricultural activities. As a primary purpose of this research focuses on rural households' perception, and practices of One Health, we designed a questionnaire investigating household economic welfare, agricultural production, individual's coping strategies to the pandemic, in addition to the demographic characteristics. During our data collection, we formally communicated with the commune leaders to identify household representatives, ensuring that both women and men were included in the interview process.

3.2. Variables

First, let's consider how the Covid-19 pandemic affected household well-being. We asked whether any family members were exposed to the corona viruses. If infected, we recorded the time of infection (before and/or after the first vaccination) and how long it took the victims for their health recovery. Therefore, we obtained a categorical variable – *Covid-19 infection*, which is adjusted as a dummy, equal to 1 if a household has infected member without any vaccines, zero otherwise.

We constructed a Covid-19 risk aversion indicator consisting of eight components. These components address farmers' belief of the danger and the unexpected consequences such as social stigma and isolation once infected (Table 1). Its sub-indicators vary from 1 (Not important at all /Strongly disagree) to 10 (Extremely Important/Strongly agree).

Table 1. Attitudes/risk perceptions of Covid-19 transmission

No.	Sub-indicator	Weight
1	I believe that my role as a farmer exposes me to an increased risk of contracting Covid-19 as I frequently interact with risky stakeholders such as farmers, sellers, who also met various people.	0.1313
2	I believe that being afraid of health condition pays an important role for farmers to follow the prevention of Covid-19 practices.	0.3260
3	I believe that abandonment, isolation, and societal pressure play important roles in following the prevention of Covid-19 practices by famers.	0.3931
4	I think that the potential economic strain (income security, debt, household expenses) plays an important role for farmers to follow the prevention of Covid-19 practices	0.4003
5	I believe that being afraid of punishment from government offices and area restriction plays an important role for farmers to follow the prevention of Covid-19 practices	0.4276
6	I believe that being afraid of punishment from local government/local administrative office is important to help farmers to cope with/respond to the challenges of transmission posed by Covid-19.	0.4153
7	I believe that local leader/village leader is important to help farmers to cope with/respond to the challenges of transmission posed by Covid-19.	0.3844
8	I believe that community engagement (interaction between community members) is important to help to share information to cope with/respond to the challenges of transmission posed by Covid-19.	0.2423

Note: Value of each sub-index ranges from 1 (Not at all Important/Strongly Disagree to 10 (Extremely Important/Strongly agree)

We used factor loadings generated by the first principal component analysis (PCA) component as coefficients as the weights of each sub-indicator for computing a Covid-19 risk aversion. Note that the factor loadings can be either positive, zero, or negative. Negative/positive factor loading means that its contribution to the synthesised indicator negatively/positively whereas zero factor loadings

imply the irrelevance of the components to the index.

A composite indicator is *One Health index* which comprises ten components (Table 2). These components investigate farmers' perception of the interdependency between human health and animal (both domestic and wildlife) welfare and natural environment. The component value ranges from 1 (no relevance) to 10 (definite inter-determinacy) which are included in the One Health single index using the factor loadings generated by the principal component analysis (PCA) technique. As a result, the One Health index captures the interpretation of rural households to protect their health from both known and unknown health disasters.

Second, a multiple-choice question is designed to ask how household economic activities were affected by national lockdowns, social distancing, and a fear of Covid-19 exposure.

Table 2. Components of One Health Index

No.	Sub-indicator	Weight
1	I believe that human health, animal health, and the environment are interconnected	0.3678
2	I believe that collaboration in different areas (e.g. livestock, agriculture, public health) is essential to the effectiveness of farmers' health operations.	0.3388
3	I believe that climate change has health implications, such as rising temperatures that could increase mosquito breeding and tick habitats.	0.3441
4	I believe that diseases that affect animals can also affect the health of people.	0.3594
5	I believe that solving animal health problems is essential to human health and well-being.	0.3516
6	I believe that solving environmental health problems helps reduce the risk of disease for animals.	0.3136
7	The well-being of animals can indicate the overall health of the environment.	0.3072
8	I believe that the resistance of germs and pests in gardens and fields is caused by climate change.	0.1884
9	I believe that eliminating pests and plant diseases could only use chemicals.	-0.0163
10	I think that contamination in water used for consumption consumer goods and others can make people and animals sick.	0.1225

Note: Value of each sub-index ranges from 1 (Not at all Important/Strongly Disagree to 5 (Extremely Important/Strongly agree)

For income variable, we firstly asked, 'compared to the Covid-19 epidemic period (2020, 2021), how has your family's income changed in 2022?' and the 5-level Likert scales were provided (1: significant income increase; 2: slight income expansion; 3: the same; 4: slight income decrease; 5: significant income decrease).

Further, we tracked household income sources encompassing three main components: on-farm activities (i.e. crops, animal husbandry, and aquaculture/fisheries), labour wage/salary, and non-farm non-wage income. Finally, basic information on household demographic characteristics and productive factors were collected as a group of control variables.

3.3. Statistical analysis and principal component analysis

The statistical analytics and a PCA are employed to provide a brief overview of the socioeconomic impacts of Covid-19 and how farmers pursue and practice more sustainable lifestyles and livelihoods after the epidemic in the context of VMD. The statistical analytics are straightforward and crucial for highlighting salient features of the main indicators attained from the collected data. Nevertheless, a PCA is exploited for handling complex variables that are synthesised by a wide range of indicators. In this study, we investigated the farmers' perception of Covid-19 transmission in agricultural activities and their readiness to adopt One Health approach to agricultural practices. It is crucial to embrace all indicators to a single index which facilitates the interpretation of the indicator contributed by multiple components.

3.4. Econometric models

A probit model for quantifying an association between income change and Covid-19 aversion is constructed as follows:

$$\Pr(betterincome_i = 1|X) = \gamma_0 + \gamma_1 Covid19\ riskaversion_i + X_i\gamma_x + \zeta_i$$

where:

$betterincome_i$ is a dummy equal to 1 if household income status was improved after the pandemic, or zero otherwise;

$Covid19\ riskaversion_i$ is an indicator representing the level of individual's behaviour to Covid-19 risk aversion;

X_i is a vector of control variable;

γ_0 is the intercept;

γ_1 is correlation coefficient on $Covid19\ riskaversion_i$;

γ_x is correlation coefficient on the control variables - X_i;

ζ_i is residual.

STATA version 17 was used for data analysis.

It is far from a consensus on an unambiguous relationship between Covid-19 risk aversion and household income due to a lack of theoretical and empirical evidence. When considering Covid-19 risk aversion a kind of economic risk, the higher risk-averse level, the more likely the household is resilient to economic shocks (Do, 2023). From the physical wellbeing perspective, regarding the health of a person as a sine qua non of (agricultural) economic performance, good health proves a prerequisite for better income (Gyimah-Brempong & Wilson, 2004; Islam, 2020; Knowles & Owen, 1995; Hoekstra, 2019). If workers strictly practise the national work-related health and safety advice against Covid-19, they had lower probability of being infected. Individuals with a high-risk aversion are more likely to better protect their health, thereby rendering positive impacts on their employment and income. For instance, Adebisi et al. (2023) found that farmers with healthy lifestyles improves their farming efficiency that could increase their incomes. Van Zon and Muysken (2003) explained that good health is paramount for increased productivity, and thus catalyses economic growth. Nevertheless, the spread of Covid-19 is proportionate to economic activities that require human interaction, meaning that those who accept risks of Covid-19 infection could deserve better earnings, or lower risk averse individuals are more likely to improve their incomes. The ambiguous nexus between Covid-19 risk aversion and household income should be further discussed while obtaining the econometric results.

4. RESULTS AND DISCUSSION

4.1. Covid-19 infection: self-protection and state financial benefits

Responding to the first research question, this subsection focuses on Covid-19 infection, households' health protection, and governmental financial assistance. First, Table 3 shows that the figure of households exposed to the corona viruses in Tien Giang is more than twice as many as in Can Tho and Tra Vinh. Particularly, over a half of households who had a least one infected member in Tien Giang whereas the number is less than a quarter in the other two surveyed areas. When asked how they got Covid-19 viruses, the major sources of infection were related to the community activities and unidentified sources or 'Do not know'.

Considering the financial support from the government as a relief for households suffering from income shocks, local governments deployed some state benefit packages for workers who stopped working because of the Covid-19 pandemic. In this survey, we questioned whether households received this financial assistance after the pandemic. Table 3 also illustrates that only one-third of rural families benefited from this program. Additionally, the economic aid was also small, ranging from 2 to 4 million VND per household. This fact is understandable as a developing country that was heavily damaged by Covid-19, Viet Nam faced a budget constraint while having a huge number of affected families and individuals.

Table 3. Covid-19 infection and government financial support

	Can Tho	Tien Giang	Tra Vinh	Total (%)
Covid-19 infection				
Household with infected members	34	86	36	156 (33.84)
Household without infected members	109	73	123	305 (66.16)
State financial assistance				
With support	72 (50.35%)	104 (65.41%)	125 (78.62%)	160 (34.71%)
Without support	71 (49.65%)	55 (34.59%)	34 (21.38%)	301 (65.29%)

Although farmers have not been directly familiar with 'One Health' concept, their interpretation of the interconnection between human health, animal wellbeing and the environment is plausible (Table

4). The sub-indices, except the components 8 and 9, range from 3.8 to 4.1, indicating that healthy human society could be only achievable when both domestic and wildlife animals and the natural environment are protected. Contaminated water caused by chemicals used for farming, and animal diseases are potentially an initiate of a new disease which transforms from animal to human, and vice versa. The eighth indicator addresses the climate change effects on pests and resistance, while the ninth indicator represents the farmers' belief that use of chemical is the only way to cope with insects.

Table 4. Households' interpretation of 'One Health' practice

Component	Mean	SD	Min	Max
1	4.03	1.05	1	5
2	4.04	0.93	1	5
3	3.92	0.96	1	5
4	3.87	1.01	1	5
5	4.08	1.03	1	5
6	3.94	0.91	1	5
7	3.80	1.00	1	5
8	3.36	1.07	1	5
9	3.08	1.29	1	5
10	4.10	0.98	1	5

Smaller values of these two components probably indicate an uncertain behaviour of farmers in seeking more sustainable solutions to the chemical uses in agricultural production.

4.2. Production, income change and Covid-19 infection

4.2.1. Stylised facts

Covid-19 induced a dramatic depletion of agricultural production, which is reported in Table 5.

Nearly two-thirds of households reported a production decline, while over 31% said that their economic activities remained constant. Particularly, with 75% and 72% of households encountering a recession, farmers in Tra Vinh and Tien Giang respectively, were more vulnerable to Covid-19 than their counterparts in Can Tho. A key driver of this decline relates to the disruption in demand for agricultural produce. Over 30% of households said that they could neither find the markets for their products nor contact to their potential middlemen/traders. Surprisingly, only one-tenth of households concerned about the Covid-19 infection whenever they were out of home to seek the demand for their products. However, production recession was also attributable to the movement restriction, since one out of ten households found difficult to be out during lockdowns and social distancing.

Table 5. Production status in the pandemic

Production change	Number of households	Proportion (%)
Whole region	461	100
Expansion	12	2.61
Unchanged	147	31.96
Decline	301	65.43
Can Tho City	143	100
Expansion	2	1.40
Unchanged	74	51.75
Decline	67	46.85
Tien Giang Province	159	100
Expansion	7	4.40
Unchanged	37	23.27
Decline	115	72.33
Tra Vinh Province	159	100
Expansion	3	1.90
Unchanged	36	22.78
Decline	119	75.32

Household income decrease is anticipated owing to the influences of the pandemic. Therefore, when we asked households to make an income comparison between during and after Covid-19, the results represented a recovery in economic outcomes, insofar as household income had been much improved after the pandemic (in 2022) compared to the previous period (2020, and 2021) (Table 6).

Table 6. Income status (Unit: No. of households)

Income source	Whole region	Can Tho City	Tien Giang Province	Tra Vinh Province
Strongly increased income	133 (28.85)	30 (20.98)	31 (19.50)	72 (45.28)
Slightly increased income	155 (33.62)	43 (30.07)	64 (40.25)	48 (30.19)
Unchanged income	85 (18.44)	41 (28.67)	26 (16.35)	18 (11.32)
Slightly decreased income	37 (8.03)	12 (8.39)	22 (13.84)	3 (1.89)
Strongly decreased income	23 (4.99)	11 (7.69)	12 (7.55)	0 (0)
'Do not know'	28 (6.07)	6 (4.20)	4 (2.52)	18 (11.32)

This means that Covid-19-related factors (e.g. social distancing, lockdowns) severely posed a threat to individual movements and damaged their production due to widespread disruptions to the demand side rather than the supply side. Many farmers claimed that they were unable to promote and sell their produce, although they found not much difficulty in continuing their production. This finding is in line with the results in Thanh and Duong (2017) who found that household income was negatively and heterogeneously impacted by health shocks.

For the income structure, we categorised income into three major sources, namely on-farm, wage, and off-farm non-wage income. Table 7 reports a heavy reliance on agricultural activities in rural households. However, in a peri-urban cluster (Can Tho City), earnings from labour-wage contribute a lion's share of the household income.

Table 7. Household income in VMD

Income source	Income per capita (1,000 VND)		
	Can Tho City	Tien Giang Province	Tra Vinh Province
Income per capita	10,037.1 (100)	4,862.35 (100)	6,264.02 (100)
On-farm income	5,162.97 (51.44)	3,393.24 (69.79)	5,133.92 (81.96)
Wage income	4,801.4 (47.84)	1,164.46 (23.95)	1,041.71 (16.63)
Non-farm non-wage income	72.73 (0.72)	304.65 (6.26)	88.39 (1.51)

4.2.2. The income change – Covid-19 risk aversion link

We further construct a probit model to quantify a potential income impact of Covid-19 pandemic, which responds to the third research question. For the extent to which household income evolved after the pandemic, we reclassify income change as a dummy, equal to one if a household experienced income rises, or equal to zero otherwise. Then, we also surveyed household's risk aversion towards Covid-19 infection. As described, the greater the value of Covid-19 risk aversion, the more risk averse to Covid-19 infection the household will be.

Table 8 astonishingly demonstrates a positive correlation between Covid-19 risk aversion and income expansion. This finding contradicts the results presented by Gloede et al. (2015), who argued that poorer households tend to exhibit greater risk aversion. Consequently, they recommended that policies aimed at poverty reduction should prevent such households from engaging in high-risk activities with potentially higher expected returns. In fact, individuals could be more likely to be infected when they participate in events involving close human-human interaction, such as teamwork, parties, or religious practices. The Covid-19 risk aversion could however be lowered when people were fully vaccinated, rendering a perception that they should be get used to with the variants of Covid-19 viruses.

Along with following the instructed hygienic practices including washing hands before and after meals, wearing face masks when going out, or being involved in community events. The survey showed that 396 out of 461 households (85.90%) use hygienic liquid or soap for handwashing when coming home. Additionally, over 98% of interviewees said that they often cleaned their hands before and after having meals. These facts can explain for the positive correlation between Covid-19 risk aversion and the probability of income rise.

Table 8. Covid-19 risk aversion and income change

Variable	Coefficient	S.E	*p-value*
Covid-19 risk aversion	0.522***	0.119	0.000
Age of household head	-0.016	0.005	0.001
Education	0.144	0.070	0.040
Male	0.021	0.129	0.870
Household size	0.037	0.043	0.390
Arable land	0.144	0.095	0.129
Mariage	-0.044	0.149	0.765
Internet	0.086	0.139	0.592
Constant	-0.950	0.541	0.079
pseudo R^2			0.068
Observations			461

Furthermore, household heads who are younger and better educated tend to experience higher income growth. Specifically, an additional completed degree increases the probability of income extension by 14.4%, whereas each year older decreases 1.6 points of getting better incomes.

Finally, we check the specification of this probit model with the *linktest* (Table 9). The results from this test indicate an appropriate model built in our analysis since the *p-value* of hat^2 is insignificant.

Table 9. Results from the *linktest* for Probit model of income change (constant is suppressed)

Income change	Coef.	S.E	*p-value*
hat	1.24	0.23	0.000
hat^2	-0.50	0.32	**0.115**

5. CONCLUSION

This paper illuminated the extent to which rural VMD was affected by Covid-19 pandemic and has adapted to changes in the new normal. Given a lack of theoretical foundation and empirical analyses owing to limited data, we used a state-of-the-art analytical framework – One Health – and economic analysis to shed light on the Covid-19 pandemic impact on household income, physical health, and their attitudes towards this health shock.

Despite being unfamiliar with the One Health concept, rural households were highly concerned with their health protection after the pandemic. This evidence is critical for informing policymaking on healthcare programs as well as fast responses to unenviable diseases in the future. Individual readiness to trust the government and support public policy is key to success, especially in the case of health shock (i.e. the Covid-19 pandemic). Thus, the positive behaviour of rural households is a factor that needs to be considered in setting up the strategy for social protection programs embracing both health and economic dimensions.

Perceiving as an ad hoc relationship between health risk and income rise, the current study found that risk-loving (i.e. with a low risk aversion) individuals and households were less likely to get better income after the pandemic. In contrast, highly risk averse individuals were more likely to improve their income. These results could be related to health issues that go beyond the boundary of this paper. However, this finding underscores a fact that rural households should not necessarily sacrifice their well-being for better earnings but to keep their health safe even after vaccinated.

As expected, education nurtures income growth irrespective of the existence of unprecedented factor – Covid-19. Therefore, encouraging rural residents, especially the household heads to bolster their skills and knowledge is also a long-term strategy to promote income extension in VMD. In contrast, the reverse effect of age on income could imply the ageing and the population problem in the region. While Viet Nam's population is growing, the VMD's stabilized population should be noteworthy.

Although the study identifies a clear relationship between health risk aversion and income, the interpretation of these findings should be approached with caution. A higher level of risk aversion is associated with a greater likelihood of higher income. While this result is statistically significant, it contradicts the notion that risk-takers are more likely to achieve better earnings. Since the study relies on a single-wave cross-sectional dataset, it cannot fully capture the intertemporal dynamics of this relationship, leaving scope for further investigation. Additionally, the study predominantly uses data collected from VMD, which may not fully reflect the rural context across the entire country. Therefore, future research should incorporate a larger sample size, encompassing observations from across Viet Nam.

CONFLICT OF INTEREST

The authors declare no competing interests.

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