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The Effectiveness of Financial Incentives for Addressing Mangrove Loss in Northern Vietnam

Thu Thuy Pham[1], Tan Phuong Vu[2]*, Tuan Long Hoang[1]*, Thi Linh Chi Dao[1]*, Dinh Tien Nguyen[3]*, Duc Chien Pham[2]*, Le Huyen Trang Dao[2]*, Van Truong Nguyen[2]* and Nguyen Viet Hoa Hoang[2]**

[1] Center for International Forestry Research (CIFOR), Bogor, Indonesia, [2] Vietnamese Academy of Forest Science, Ha Noi, Vietnam, [3] VNU-University of Economics and Business, Vietnam National University, Hanoi, Vietnam

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***Correspondence:**
Thu Thuy Pham
t.pham@cgiar.org
Tan Phuong Vu
phuong.vt@vafs.gov.vn
Tuan Long Hoang
bberviet@gmail.com
Thi Linh Chi Dao
chi.daolinh161194@gmail.com
Dinh Tien Nguyen
ndtien.up@gmail.com
Duc Chien Pham
p.d.chien@vafs.gov.vn
Le Huyen Trang Dao
huyentrang0804@gmail.com
Van Truong Nguyen
truong.nv@vafs.gov.vn
Nguyen Viet Hoa Hoang
hoa.hnv@vafs.gov.vn

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This paper analyzes the effectiveness of existing financial incentives for mangrove conservation in Vietnam. Current conservation programs and projects have created financial incentives for mangrove protection, but the effectiveness of these incentives in addressing mangrove loss in northern Vietnam has been mixed. While financial incentives have contributed to a larger area of planted mangroves, their effectiveness is hampered by contradictory national policies, which encourage mangrove conservation on the one hand, and aquaculture expansion in mangrove areas on the other, thus making it difficult to address mangrove deforestation and degradation effectively. Mangrove conservation in Vietnam is challenged further by inequitable distribution of power and benefits, difficulties accessing information, weak law enforcement, lack of compliance, low payments for protecting mangroves, lack of full recognition of local rights, discontinued funding after policies and projects end, and lack of participation by local people in policy and project design and implementation. Conservation policies and projects should aim to protect existing mangrove forests, restore degraded mangroves and plant new ones to enhance mangrove area, quality and biodiversity. Sustainable mangrove conservation not only requires effective and sustainable financial incentives, but other enabling conditions such as addressing the conflict between mangrove conservation and aquaculture expansion, and grounding mangrove conservation projects by building on local knowledge and leadership. As these drivers are often motivated by national development goals and other sectoral development needs with ministries competing for budgets and influence, holistic land-use planning needs to be coupled with effective coordination and clarification of responsibilities between government agencies, and coordinated and consistent policies concerning these natural resources. Addressing these underlying governance issues is far more important for mangrove conservation and restoration than merely offering financial incentives as various national and international projects have attempted.

Keywords: mangrove, Vietnam, deforestation, financial, incentive

INTRODUCTION

The Warsaw Framework for REDD+ highlights the need to address the diversity of drivers of deforestation and forest degradation (UNFCCC, 2013). There has been increasing emphasis at both global and national levels on the need for more rigorous assessment of existing policies and initiatives (Duchelle et al., 2018; Pirard et al., 2019; Bos et al., 2020; Pham T. T. et al., 2020; Pham et al., 2021), as impact evaluations derived from past and present experiences can inform and improve new generations of policy and project interventions (Slootweg et al., 2001). Mangroves provide important environmental services for humankind, but are in decline globally and exposed to various drivers of deforestation and degradation (Giri et al., 2015; López-Angarita et al., 2016; Richards and Friess, 2016; Goldberg et al., 2020). To address these drivers, global initiatives like the Global Mangrove Alliance (Friess et al., 2020), REDD+ (Yee, 2010; Ammar et al., 2014; Aziz et al., 2016), payment for environmental services (PES) and national policy interventions (Wever et al., 2012; Locatelli et al., 2014; Friess and Thompson, 2016; Sommerville, 2016; Thompson et al., 2017) have been developed. However, these incentives have been impeded by unclear and contradictory regulatory frameworks across different levels of government, and failure to engage local people in policymaking and project design and implementation (Ahmadia et al., 2015; Friess et al., 2016). In addition, there is little independent monitoring and evaluation to assess the effectiveness of policies and projects.

To address these gaps, a large number of studies have been devoted to assessing the effectiveness of mangrove conservation projects, which often include a component on mangrove restoration policies and activities (Primavera and Esteban, 2008; Miteva et al., 2015; Kodikara et al., 2017; Ellison et al., 2020; Al Amin et al., 2021). To assess the effectiveness of these schemes, some authors have applied quasi-experimental techniques to compare what actually happened to what would have happened in the absence of any intervention (Ferraro, 2009; Miteva et al., 2015). Others have used a socio-economic assessment approach to unpack local perceptions on how effectively mangrove conservation policies and projects address mangrove loss on the ground while ensuring local livelihoods from aquaculture (Maliao and Polohan, 2008; Ahmadia et al., 2015; Mwangi et al., 2017; Santos et al., 2017), or have adopted remote sensing and spatial analysis, or *in situ* measurements and field observations (Seto and Fragkias, 2007; Li et al., 2013). Increasing attention is being paid to the need for more studies on the socio-political and institutional aspects of mangrove conservation efforts (Datta et al., 2012; Sahu et al., 2015; Apollonio et al., 2016; de Almeida et al., 2016; Dharmawan et al., 2016; Damastuti and de Groot, 2017; Triyanti et al., 2017; Singh et al., 2019; Turschwell et al., 2020; Mollick et al., 2021), as successful policy intervention depends on public trust and support from government agencies and projects (Harring, 2018), actors' ideology and interest and the political economy of drivers of deforestation and degradation (Brockhaus et al., 2021), political interaction by government with various interest groups (Oates and Portney, 2003), how benefits are shared (Pham et al., 2014a), local champions, the emergence of a crisis point, the involvement of decision makers and long-term financial and institutional support (Young et al., 2012), and how policies and projects align with local grassroots knowledge and perceptions (Dharmawan et al., 2016). Using case studies from Vietnam, this paper explores stakeholder perceptions on the effectiveness of existing mangrove conservation initiatives in the country.

According to the IMHEN and UNDP (2015), Vietnam, with its long coastline is vulnerable to climate change impacts. Although coastal forests cover just 3.5% of the total national forest area, they play a significant role in generating local livelihood incomes, mitigating the impacts of storm surges and coastal erosion, and supporting carbon sequestration and biodiversity conservation. Around 86% of the country's coastal 'protection forest' area constitutes mangroves (MARD, 2018). The Government of Vietnam recognizes the importance of mangroves in protecting coastal areas, and has issued several policies, including its Nationally Determined Contribution, the Vietnam Forestry Development Strategy 2021–2030 with vision to 2050, and Decree No. 119/2016/ND-CP, which place significant emphasis on protecting and expanding mangrove area in Vietnam (Pham and Nguyen, 2021). Through the Vietnam Forestry Development Strategy 2021–2030 with vision to 2050, the government aims to develop a sustainable mangrove forest management plan for the northern part of Vietnam and has called for more scientific analysis of lessons learned from past activities to provide input for this plan.

Specific investment programs responding to climate change have also been approved for implementation, including the Support Program to Respond to Climate Change (SP-RCC) and a project on the protection and development of coastal forests in response to climate change (Prime Minister of Vietnam, 2015). The Government of Vietnam sees mangrove conservation as a key policy for addressing climate change impacts and protecting coastal communities (Sam et al., 2005; Government of Vietnam, 2021). Sustainable mangrove conservation for climate change also marks a key future policy and investment priority, as per the approval of the National Climate Change Adaptation Plan for 2021–2030 (Prime Minister of Vietnam, 2020), and Vietnam Forestry Development Strategy for 2021–2030 (Prime Minister of Vietnam, 2021), which aims to ensure that forest area accounts for 42–43% of the country's total land area. Sustainable mangrove conservation is also an important measure in Vietnam's Nationally Determined Contribution (NDC) (UNFCCC, 2020), with a follow-up national program currently in preparation on investment for 2021–2025 in the protection of coastal forests and improving local livelihoods for coastal communities using mangroves. Sustainable mangrove conservation, as stated in Vietnamese policies, refers to mangrove conservation policies and projects that not only expand the area of mangrove forests, but also enhance their quality and capacity to support coastal communities. However, failing to connect future policies and programs with lessons learned from previous experiences could result in ineffective, inefficient and inequitable outcomes.

Various studies have attempted to investigate the effectiveness of policies and measures to address the drivers of deforestation

and degradation in Vietnam. However, these have often assessed national policy initiatives while overlooking sub-national programs and community-led projects (Hawkins et al., 2010; Jhaveri et al., 2018; Kissinger, 2020; Pham T. T. et al., 2020). Using comparative case studies in Thanh Hoa, Quang Ninh and Thai Binh provinces, this paper analyzes the effectiveness of existing financial and policy incentives, at both national and sub-national levels to address the drivers of mangrove deforestation and degradation. Our aim is to provide lessons learned that could be useful for future mangrove conservation programs.

MATERIALS AND METHODS

Study Sites

The study was conducted in six villages in the provinces of Thanh Hoa, Thai Binh and Quang Ninh in northern Vietnam (**Figure 1**). Vietnam's administrative structure is subdivided into three levels: provincial, district and commune. Communes consist of a number of villages. The northern part of Vietnam was selected as it is strongly affected by climate change. The three provinces have been placed under national mangrove protection projects due to their shrinking area of mangrove forests, which have been in decline since the 1960s (Bui et al., 2014; Pham H. T. et al., 2020). However, few studies to date have examined the effectiveness of these projects or provided lessons learned for future mangrove conservation policies. Drivers of mangrove deforestation and degradation are analyzed in detail in Section "Drivers of Mangrove Deforestation and Degradation."

To address this knowledge gap, we selected these study sites to represent different aspects of mangrove conservation in Vietnam, including government management regimes, forest ownership, local income sources, accessibility to mangrove resources and land, and prior experience of mangrove management (**Table 1**).

Local people in these six villages rely primarily on aquaculture (Pham et al., 2019a). Livelihood sources include incomes derived from mangroves such as payments from programs and projects to patrol mangrove forests, seafood harvesting, honey farming, hunting birds, collecting timber and firewood from mangroves, ecotourism, and aquaculture. People from all six villages also have off-farm incomes from migrating to work in other cities or provinces (Kelly and Adger, 2000; Pham and Yoshino, 2011).

Methodology

The study employed a variety of methodologies. We first reviewed legislative and policy environments, and past and present mangrove conservation programs. We then conducted interviews with 34 key informants in the three study provinces (**Table 2**). Key informants included: ten government officials; six mass organization representatives, including women's unions and farmers' associations; two civil society organizations; and the six village heads. These stakeholders were selected because they were directly involved in the design and implementation of policies and projects. These interviews aimed at understanding stakeholders' perceptions of the drivers of deforestation and degradation in their areas, the effectiveness of national and foreign mangrove conservation policies and projects in addressing these drivers, and their recommendations for future policies and projects.

We also conducted 24 focus group discussions (FGDs) with a total of 240 participants across the six villages, and household interviews with 604 households in total (**Table 3**). We held four FGDs in each village: one with young women between 16–25 years old; one with women over 25 years old; one with young men between 16–25 years old, and one with men over 25 years old. Participants in these FGDs, averaging 10 household representatives per group, and surveyed households were selected randomly from official lists of villagers provided by commune people's committees. FGDs and household surveys covered similar discussion topics, including drivers of deforestation in the study sites, policies and projects implemented to address these drivers, and their effectiveness in achieving their intended objectives. To ensure people were active in discussions and no one taking part in the FGDs felt excluded or was inattentive, we used participatory visual communications tool such as pictures, cards and drawings. FGDs were only organized with villagers without village heads in attendance to ensure villagers felt free to express their thoughts. Survey instruments are fully presented in the **Supplementary Material**.

The FGDs and interviews were designed and conducted adhering to the ethical standards established within the scientific community. All questions used in FGDs, household and key informant interviews were reviewed by the local governments as part of the process to obtain research permission to work in the studied sites. The research objectives, data collection process, confidentiality by guaranteeing the anonymity of all villagers and key informant respondents were explained to the participants, and their consent was explicitly asked for.

RESULTS

Drivers of Mangrove Deforestation and Degradation

Participants in FGDs and household surveys in all six villages pointed out complex drivers of mangrove deforestation and degradation, ranging from natural drivers like typhoons and storms to complex socio-economic drivers rooted in national and provincial socio-economic development policies (see **Figure 2**). Among these, participants in FGDs and household surveys ranked the six main drivers as follows: natural disasters; mangrove conversion for aquaculture due to government policies promoting economic development and local needs to improve livelihoods; poverty; water pollution due to chemical waste from thermal plants and plastic waste from residents; migration; and limited awareness of local people on forest protection.

Natural Disasters

Ninety-two FGD participants mentioned natural disasters, such as typhoons, landslides and storms as being major drivers of mangrove loss. Participants in Thai Binh said they have observed increasing numbers of storms and floods since the 1990s. FGD participants in Thai Binh and Quang Ninh provinces also said that where two major storms a year used to be the norm, four

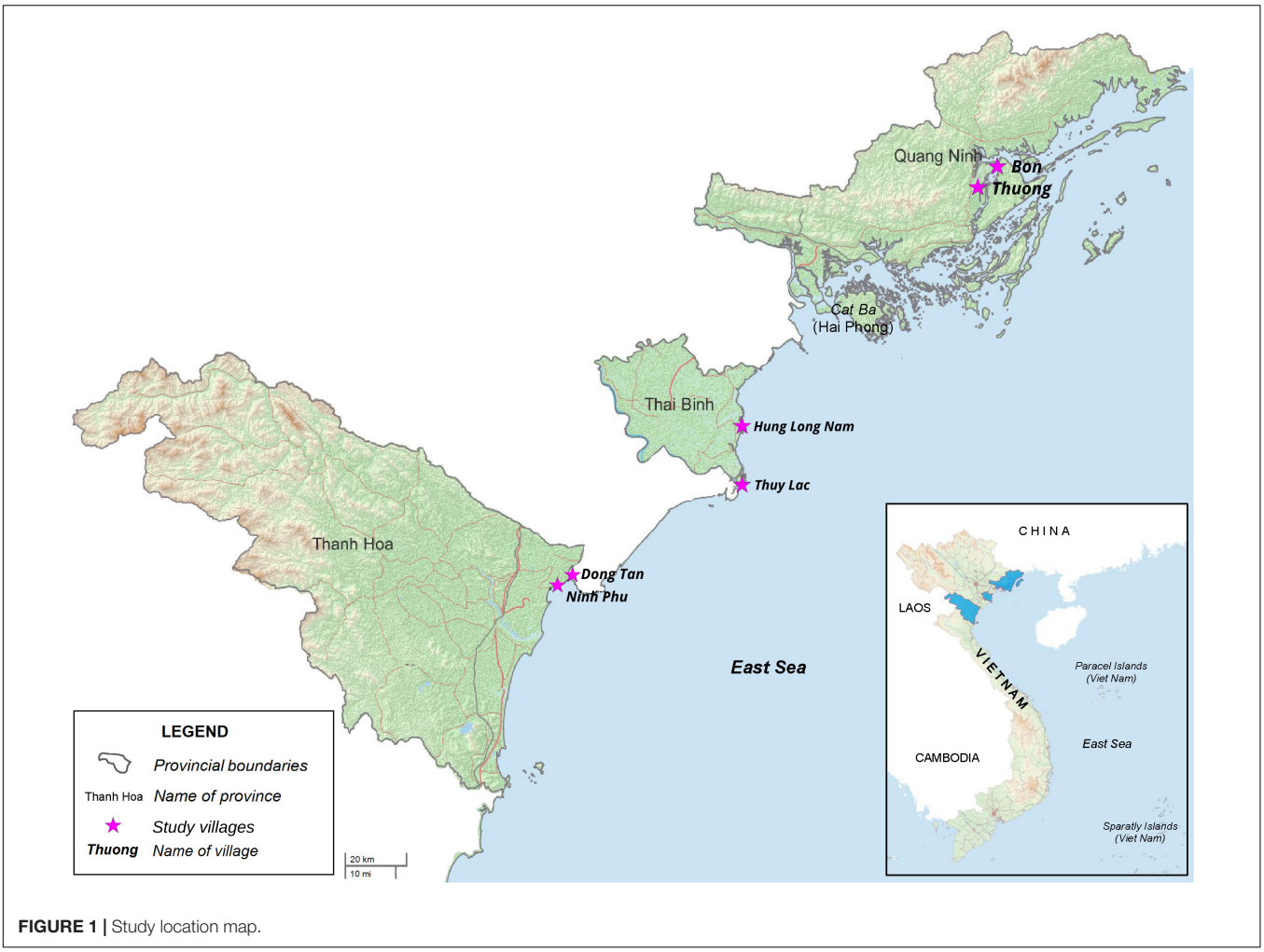

FIGURE 1 | Study location map.

or five a year has become commonplace in recent years. These FGD participants also pointed out that natural disasters have damaged large areas of mangrove forests. This was confirmed by many sources including government reports (VOV online, 2013), donor reports (Nguyen, 2003; IFRC, 2012; Vietnam Red Cross et al., 2013; MARD, 2017), media articles (VNA, 2016; Nguyen, 2020) and scientific reports (Veettil et al., 2019). They also noted that storm impacts on housing were less severe in areas with mangroves than without. Most of the households surveyed (60%) and key informants interviewed (48%) also referred to natural disasters as drivers of mangrove loss (**Figure 2**).

Mangrove Conversion for Aquaculture and Development Programs

More than 90% of households surveyed in the six villages cited aquaculture production as their primary source of income and admitted they only stopped being involved in mangrove clearing 5 years earlier. Conversion of mangroves for aquaculture was cited as the main driver of mangrove loss by 76% of key informants interviewed, 50% of households surveyed and 63% of FGD participants (**Figure 2**). Twenty-three out of 34 key informants interviewed, 100% of FGD participants and 30% of surveyed households said aquaculture development has always been a priority of the provinces, and provincial people's committees had issued many policies encouraging local people to clear mangroves for aquaculture development between the 1970s and early 2000s. As one FGD participant explained, "*I'm not originally from this province. I migrated from my hometown in Hai Duong province to Thai Binh in 1997 as part of the government migration program to promote economic growth. When we first arrived here, there was a large area of mangroves. Government officers encouraged us to clear as many mangroves as possible to develop and expand aquaculture production. We even received certificates showing how much mangrove we were able to convert for aquaculture production.*" One interviewed government official also said, "*Aquaculture can generate high incomes for local people, so in the past when the province was still poor and we had little economic development, previous leaders issued numerous policies on converting mangroves for aquaculture production.*"

The need to protect mangrove forests has only been emphasized in provincial policies over the last 10 years, but drivers like infrastructure development and conversion to aquaculture by government agencies and large-scale companies to meet provincial economic development goals still persist.

TABLE 1 | Background information about the study villages.

Village	Ethnicity	Main income sources	Mangrove area (ha)*	Formal forest managers	Who patrols forests?			Who has exclusion and prosecution rights?		
					Commune people's committee	Local community and people	Commune border police	Commune people's committee	Local community and people	Commune border police
Dong Tan	Muong, Dao, Kinh	Aquaculture and livestock	220	District people's committee**	x	x	x	x		x
Ninh Phu	Kinh	Aquaculture and remittance	70	District people's committee	x	x	x	x		x
Hung Long Nam	Kinh	Aquaculture, agriculture and remittance	170	District people's committee	x	x		x		
Thuy Lac	Kinh	Aquaculture, ecotourism, factory work	150	District people's committee	x	x		x		
Thuong	Dao and Kinh	Aquaculture and factory work	600	Commune people's committee	x	x		x		
Bon	Dao and Kinh	Aquaculture and ecotourism	677	Local communities		x		x		

Source: Data compiled by the authors in 2018.
**Mangrove forests in these six villages have all been planted since the early 1990s.*
***Vietnam's local administration is organized at three levels, provincial, district and commune. Provincial and district People's Committees can establish forests that are not of national importance and allocate use rights for all types of forest. Provincial People's Committees can designate rights to economic organizations or other organizations, while District People's Committees can designate rights to communes, households, individuals, and communities.*

Similarly, road construction and dike management have been positioned as priorities for developing provincial economies, and provincial leaders saw them as unavoidable compromises.

Poverty

Figure 2 shows 29% of FGD participants mentioning poverty as the main driver of mangrove deforestation, while only 9% of key informant interviewees and 10% of households surveyed cited poverty as a key driver of mangrove destruction. Eight out of ten government officials and all FGD participants, cited poverty as having been another driver of deforestation in the past, saying due to a lack of income and employment opportunities, local villagers had needed to clear mangroves for firewood to sell, expand grazing areas to increase income from livestock, and for ease of access to harvest seafood. Household interviews provided similar results, though they also showed clearing mangroves for firewood had stopped 10 years earlier, and nowadays people have better access to electricity and no longer need firewood for cooking and selling.

TABLE 2 | Numbers of key informant interviewees in the study sites.

Province	Total Number	Number of men	Number of women
Thai Binh	17	16	1
Thanh Hoa	11	7	3
Quang Ninh	6	4	2
Total	34	27	6

Water Pollution

While mangrove conversion for aquaculture, natural disasters, migration and poverty were seen as common drivers across the six villages, water pollution was specific to Thuong and Bon villages in Quang Ninh province and Hung Long Nam village in Thai Binh province. Government officials and all FGD participants in Quang Ninh and Thai Binh pointed out that

TABLE 3 | FGD and household interview sample sizes in the study sites.

#	Province	Study village	Mangrove area (ha)	No. of FGD participants	No. of households interviewed	% of female respondents	% as female heads of household
1	Thanh Hoa	Dong Tan	220	38	100	73	22
		Ninh Phu	70	42	100	40	18
2	Thai Binh	Hung Long Nam	170	41	101	86	11
		Thuy Lac	150	39	101	61	14
3	Quang Ninh	Thuong	600	39	103	89	24
		Bon	677	41	99	57	9

Sources: Central Population and Housing Census Steering Committee (2010); Dong Rui Commune People's Committee (2017); Nam Phu Commune People's Committee (2017); Da Loc Commune People's Committee (2018); Dong Long Commune People's Committee (2018); VNFOREST (2018); and Thanh Hoa Provincial Department of Agriculture and Rural Development, 2017.

the Thai Binh thermal power plant, Ba Che Paper Mills and Mong Duong thermal power plant have caused serious water pollution, leading to the destruction of mangroves. According to one FGD participant in Thai Binh, "*Thai Binh Thermal Power Plant had no wastewater treatment, so their discharge polluted water surrounding the village and ran through the mangrove area causing both new seedlings and existing mangroves to die.*" Informants cited plastic waste as another major cause of water pollution and mangrove degradation, with one FGD participant in Quang Ninh stating that, "*Residents throw waste and plastics directly into the sea. Small fishing platforms also dump plastic bags and waste into the sea. In fact, if you walk through the mangrove area in the afternoon or early morning you can see nothing but plastic. We do think this affects the health of mangroves.*"

Migration

While migration was seen as the main driver of mangrove deforestation by 21% of FGD participants, only 1% of households interviewed and 3% of key informants interviewed perceived migration as a key problem driving mangrove loss (**Figure 2**). All six key informant interviewees in Quang Ninh province said increasing numbers of migrants from other provinces (Ha Nam and Nam Dinh) had moved to Bon and Thuong villages to invest in aquaculture production. Most households interviewed in Dong Tan (67%), Thuong (58%) and Bon (88%), and some in Ninh Phu (20%), Hung Nam Long (14%) and Thuy Lac (17%) were migrants. These households said the government had encouraged them to migrate to these provinces to clear mangroves for the expansion of economic development zones. They said these migrants are often wealthy families with the financial resources necessary to bid for large areas for aquaculture production. They can also rent large areas of land from local people to open aquaculture farms and hire local people to clear mangrove forests. There are big gaps in terms of income between rich and poor households, and household incomes vary both within and across the six study sites. In Hung Long Nam village, FGD participants said rich households could earn VND 738 million a year on average, while poor households could only earn up to VND 30 million a year. Incomes of villagers in Hung Long Nam were twice those of villagers in Dong Tan. More than 30% of interviewed female heads of households and all female FGD participants in Hung Nam Long village said that since aquaculture ponds surrounded by mangroves are being privatized by rich migrants, they now have less access and fewer earnings derived from fisheries and can only harvest in small public mangrove areas.

Limited Awareness Regarding Forest Protection

Limited awareness of local people on forest protection and forestry policies are cited by 32% of household surveyed, 18% of key informants interviewed and 42% of FGDs meeting (**Figure 2**). Government officials interviewed in all three provinces claimed people had limited understanding of the roles of mangroves and government policies on mangrove protection. One government official interviewed in Quang Ninh stated that "*Local people don't know about the importance of mangroves, and lack awareness of government policies on mangrove conservation.*" Government officials in all three provinces said in cases of violations where local people had been arrested or fined for mangrove destruction, they claimed had they were unaware of government policies or who mangrove forest owners were. Despite these government officials pointing to ignorance over mangrove conservation rules and which government agencies (provincial, district or commune) owned mangroves, most participants in FGDs in the six villages, as well as 83% of households interviewed in Thuy Lac village and 76% of those in Bon village did know which government agencies were mangrove owners and what mangrove conservation policies were being implemented. One mangrove conservation participant in Thuy Lac village said, "*We've participated in many government-run training sessions on mangrove protection policies, so we know what they are. Moreover, we listen to the radio and watch television, and we understand we need to protect mangroves for our future benefits.*" There were no differences of opinion between men and women or between different ethnicities in regard to drivers of mangrove deforestation. Male and female FGD participants across all sites shared similar views on drivers of mangrove deforestation. These are outlined in **Figure 2**.

The Effectiveness of Financial Incentives in Addressing Drivers of Mangrove Deforestation and Degradation

All six study villages have access to and have prior experience of mangrove management from state and foreign mangrove conservation programs (**Table 4**). Mangrove planting in the three provinces has mostly been carried out through international and domestic reforestation programs. Mangrove forests in the provinces are either managed by district Forest Protection and Development Departments' Project Management Units (PMUs), which sign annual mangrove protection contracts with communes or other organizations (in Thanh Hoa) or managed by Provincial People's Committees (PPCs) and their representative, the Department of Agriculture and Rural Development (DARD) (in Quang Ninh and Thai Binh). DARD signs annual contracts with communes to protect the mangroves within their jurisdictions, providing funds from the state budget to cover costs. Communes also carry out mangrove rehabilitation funded by provincial authorities or with support from donors.

When asked "What are the changes in terms of mangrove area in your village?," 98% of households surveyed across the six study villages agreed that the area of mangroves had grown in their regions over the last 5 years as a result of programs run by international donors such as The Japan International Cooperation Agency (JICA) and the European Union (EU), and as a result of increased awareness of the roles mangroves play.

All participants in focus group discussions held in the six study villages said these state and foreign programs have provided financial support for local people to plant and patrol mangrove forests, training on the development of alternative livelihood options, and raised awareness on the roles and importance of mangroves. While these villagers felt this financial support has had positive outcomes, no official government data on its effectiveness was available. **Figure 3**, which was generated from remote sensing data coupled with ground truthing shows no

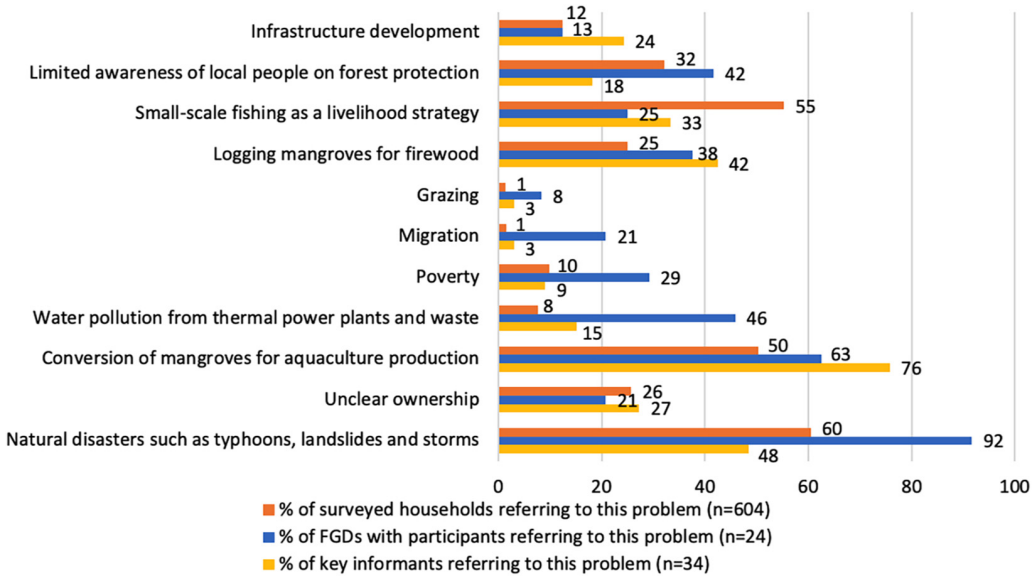

FIGURE 2 | Stakeholder perceptions on the drivers of mangrove deforestation in the six study villages.

TABLE 4 | Policies and financial incentives for addressing drivers of mangrove deforestation and degradation.

Policies/incentives	Government programs	International programs
Payments under annual forest protection contracts signed with local people.	VND 50,000–100,000 per hectare per year before 2010 (661 programs) and VND 3,000,000 per hectare for 6 years since 2017	Only pay for planting, but not for protection activities
Support for protecting special use forests	VND 30,000,000 per hectare	Not applicable
Support for mangrove conservation	VND 1,100,000 per hectare per year	Not applicable
Support for the establishment and operation of nurseries for seedling production	VND 75,000,000 per nursery	Not applicable
Payments for mangrove planting labor	VND 120,000–150,000 per day	VND 20,000–150,000 per day
Organizing waste collection activities in mangrove and coastal areas	No payment, community social responsibility	Some projects mobilize communities, but some pay VND 50,000 per day for local people to collect waste
Providing free seedlings	Yes	Yes
Setting up financial mechanisms to cover mangrove planting and protection		Local villagers contribute VND 2,000 each time they enter mangroves to collect fish and crabs, and fines are collected in Dong Rui commune (Quang Ninh) from people penalized for violating laws and for illegal destruction of local community mangroves. In Thai Binh province, people who report violations and violators will receive rewards of VND 200,000 for each report made.
Non-monetary incentives	Provision of training on government policies relating to mangrove conservation	Provision of free fertilizers, livestock and capacity building/training for alternative income options

Sources: Information compiled by the authors from reviews of government policies and project documents, and from FGD and household survey results.

increase, and in reality the areas of both natural and planted mangroves remaining relatively stable between 2016 and 2019 in the five communes where our study villages are located.

Stakeholders participating in FGDs and household surveys highlighted a number of benefits resulting from the mangrove protection policies now in place. They noted, for example, how these policies have helped strengthen law enforcement and raised local awareness on the roles forests play and the importance of their conservation, and have limited conversion of mangroves for other economic activities. According to FGD participants in Hung Long Nam village, for instance, before 2017, no villagers took part in mangrove forest patrols. However, since 2017, villagers have been receiving VND 87 million from government and foreign projects to cover time spent patrolling mangroves. The village has decided to use 15–20% of these funds to cover patrol costs for villagers to monitor forests, while the remainder is used for paying villagers to replant mangroves. Each participating villager earns USD 20–50 a year for their forest protection efforts. According to most villagers surveyed in Hung Long Nam, this additional income has been a major reason for people becoming

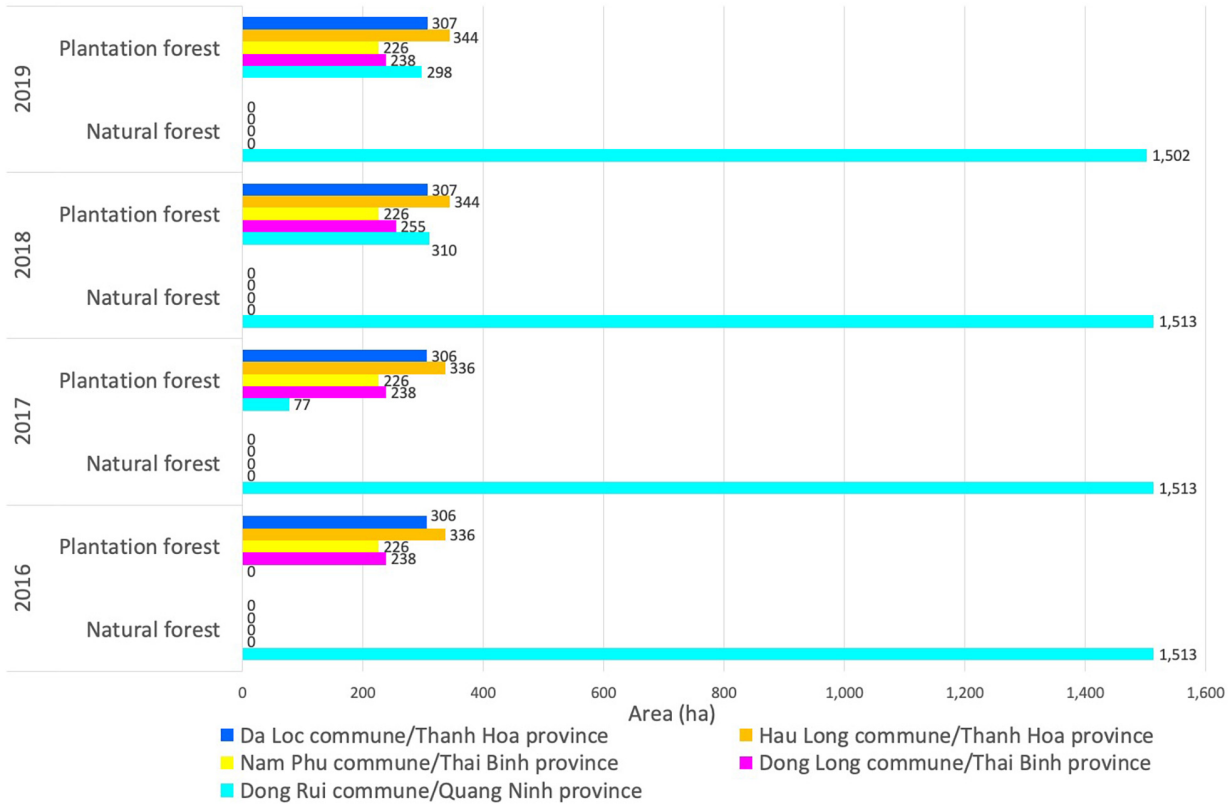

FIGURE 3 | Changes in forest area in the study communes. Source: Institute for Forest Ecology and Environment (2020).

involved in mangrove conservation. FGD participants in all six villages said more frequent forest patrolling had helped reduce illegal mangrove logging in their village areas.

Government and international projects have also provided capacity building and free seedlings for mangrove reforestation in the study sites. While government projects only provide financial support, provincial authorities and FGD participants across the six villages said non-state projects offered in-kind payments, such as livestock and training for local people on improving livelihood options. For example, training was provided on sustainable seafood production and techniques for rearing livestock more effectively. According to most surveyed households, such training was actually more important and useful to them than receiving monetary benefits. One household respondent said, "*Thanks to international projects, we've had opportunities to get training from experts on rearing livestock or seeking new income opportunities, and this is more useful for us comparing with in-cash payment.*" Interviews conducted with women's unions, youth unions or farmers' associations also revealed that their members (both men and women) had actively supported planting new mangroves. According to the women's union in Dong Rui commune, they had been nominated to lead a mangrove planting project funded by the Commune People's Committee.

FGD also showed that while local people derive more than 70% of their income from aquaculture and they had cleared mangrove in the past for this purpose, participants also pointed out the downsides of aquaculture. More than 80% of male and female participants in the FGD in Hung Long Nam said shrimp farming had caused serious soil erosion in their region. Male and female participants in the FGD in Thuy Lac both said only a small number of wealthy households could open, expand and benefit from their own private aquaculture ponds, and because mangrove forests are being privatized, poor households are restricted to accessing only public mangrove forests. Men and women participating in the FGD in Dong Tan village both said that due to a lack of access to aquaculture ponds, conflicts had intensified between wealthy migrant families and local people. As a result, many FGD participants were not in favor of clearing mangroves for aquaculture production.

Pitfalls of Incentives for Addressing Drivers of Mangrove Deforestation and Degradation

Although incentives have to some extent motivated local people to protect mangroves, our findings also reveal several pitfalls hampering effective, efficient and equitable mangrove protection and development.

First, most government officials interviewed claimed that overlapping mandates and responsibilities over mangrove management between government agencies and between different levels of government pose challenges to implementing

mangrove conservation policies and projects. **Table 1** shows multiple government agencies involved in managing mangroves, including district people's committees, commune people's committees, and border police. However, these officials admitted to an unclear division of tasks and responsibilities between these actors. This leads to weak law enforcement on the ground, and more than 40% of households interviewed in the six study villages said they were unsure who manages their mangroves and what government agency they need to report violations to. Villagers interviewed said they lack ownership over current mangrove protection projects and programs and therefore feel no strong commitment to such efforts. These stakeholders claimed that mangrove forests are government property and therefore land-use rights belong to the government. More than 60% of households interviewed across the six villages said their commitment to protecting mangrove forests was low, as they were just providing labor for projects. One villager in Quang Ninh explained this saying, "*We're hired labor for someone else, so we just do what we're paid to do. It would be different if this forest was our property. If it was, we'd protect it and manage it full time. At the moment, as it's not our land, if they pay us to patrol it one or 2 days a month, then that's what we'll do.*" Even in study villages in Quang Ninh province, where the government has allocated mangroves to villages for protection, and communities have their own rules requiring local people to contribute VND 5,000 to village funds each time they visit public mangroves to fish or collect seafood, the village heads interviewed claimed such initiatives had been introduced by foreign projects without building on local ownership. As one interviewed village head explained, "*This was introduced to us by a foreign program. Of course, while their project is still active in the region we'll follow this model as get financial support to do so. But I'm not sure if we'll continue this model once the project ends as it wasn't developed by us.*" They also said that although local government had allocated mangroves to communities, they do not have full land-use rights. One villager elaborated on this saying, "*We're allocated mangroves but not the rights to use or benefit from them. In fact, rights only come with the responsibility to protect them more, with no associated benefits.*" All household survey participants in Thanh Hoa and Thai Binh provinces also said that when government agencies and officials selected households to join mangrove forest conservation programs, they would often choose their relatives or those with power, such as village heads or community party secretaries. As a result, many poor households cannot participate in or benefit from such policies and projects. FGDs revealed that international projects have been ineffective in disseminating information to local people. Respondents in most villages said only elite groups (village police) were informed about project activities and had opportunities to access related payments. As one villager in Thai Binh said, *"Our village head receives information, which he makes sure his family members and relatives hear first so they can register themselves in government programs. We don't know about these programs to register."*

Second, FGD and household survey results show that most incentives provided by state and non-state institutions are aimed at improving seedlings and offering financial incentives for locals to plant mangrove forests (**Table 4**). However, most FGD stakeholders and interviewed government agency staff said neither state nor non-state programs provided seedlings that suit local conditions. As a result, seedling survival rates had been low, and the quality of planted mangroves failed meet local expectations. As one villager explained, "*Government agencies and international projects provide us with seedlings to plant mangroves, but they're not the traditional species we've seen before from natural forests used by our ancestors. They don't seem to grow very well in our village.*" Further, none of these initiatives have aimed to address drivers of mangrove loss and degradation, such as government policies to convert mangroves for infrastructure development or aquaculture production. Most (70%) of the government officials interviewed claimed it is easier for the government to improve technical issues rather than address political needs rooted in the requirement to secure better economic returns from the land. One district government agency interviewee said, "*We're told to protect mangrove forests but we're also tasked with showing increased annual GDP and boosting the economic returns from the aquaculture sector by expanding aquaculture production. As economic development is our province's priority, our provincial people's committee gave more favorable support to expand aquaculture and we, at the district level, have no power to change this and have to follow decisions made at a higher level.*" One provincial government interviewee said, "*It is up to national and provincial authorities to expand our land to the sea and develop new ports and now coastal economic development zones. Consequently, we have to clear mangrove forests for these development priorities.*"

Third, current incentives are mainly aimed at planting new mangroves; there are no strong incentives to conserve existing mangroves (**Table 4**). For example, between 2014 and 2020, the national Support Program to Respond to Climate Change (SP-RCC) allocated VND 412.7 million for forest protection activities but allocated 7.7 times that amount (VND 3,195 million) for planting new forests. Most government agency staff interviewed and FGD results in the three provinces revealed that actors receive higher financial incentives for replanting than for protecting existing mangroves. For example, as discussed earlier, each household can only earn VND 1 million a year for patrolling forests, whereas FGD participants in all six villages said they can already earn from VND 1,050 million to 1,5 million in 7 days replanting mangroves. In interviews, commune government officials also said new plantation programs would pay costs for planting and at least 1–2 years of maintenance. Consequently, local people taking part in FGDs said they prefer engaging in projects establishing new mangroves to those protecting existing mangrove forests.

Fourth, according to FGD participants and government agency stakeholders, the costs of mangrove conservation in the study sites are significant; the mangroves are affected by coastal erosion, regular tidal inundations and sandy soils. With such conditions, all interviewed government officials said costs for planting mangroves vary between VND 90 million and VND 500 million per hectare. Yet, government incentives only cover around a third of these costs. Financial incentives offered by state and non-state programs are also unable to compete with the amounts earned from aquaculture production. For example,

according to FGD participants in Quang Ninh and Thai Binh, on average, selling seafood can provide women with daily incomes of VND 50,000 to VND 1 million, while men, who have longer work hours can earn at least 30% more than women. Meanwhile, the daily payment received for either planting or patrolling mangrove sites is just VND 20,000–150,000. Men and women interviewees and FGD participants both felt the payments from national and foreign projects were too low. One male FGD participant in Thanh Hoa said, "*They only pay us VND 20,000 a day to plant mangroves while I can earn up to VND 500,000 a day gathering seafood. The commune people's committee told us we plant mangroves as part of our social responsibility, and the small payments are aimed at helping us buy food and drinks rather than compensating us for our time and labor. However, we need to earn income first before we can practice our responsibility."* In addition, even though some projects cover the costs of planting mangroves, they lack follow-up incentives or support for conservation or protection of planted mangroves. This might help explain why only 30% of households interviewed across the six villages are currently participating in any mangrove conservation programs. FGD results in all six villages also showed that young people are less engaged in mangrove conservation projects because they migrate to work in the cities, feel a lack of connection to mangroves and therefore are not interested in their protection. Government agency staff in all three provinces also said that as soon as foreign projects ended and payments for local people to patrol mangroves stopped, local people would stop protecting and patrolling mangroves.

Fifth, both male and female FGD participants in Thanh Hoa and Quang Ninh provinces claimed that there is a lack of involvement of local people in the design and implementation of mangrove conservation policies and projects, and therefore their activities do not fully address local needs. In these two provinces, 40% of households interviewed claimed that government agencies and projects had not consulted local communities about the management and conservation of mangroves before pursuing activities. According to most participants taking part in the six village FGDs, incentive designs also overlook gender aspects. Results from FGDs in the six villages show that women engage directly in seafood collection in mangrove areas, while men often go offshore fishing and migrate to cities for work. However, government and foreign projects often prefer men to take part in patrol teams, and it is household heads, who more often than not are men, who are invited to government and project meetings. According to most female heads of households interviewed, this arrangement excludes women from participating in and benefiting from government and foreign projects. As one female head of household explained, "*Most of the time it's us women who spot violations because we collect seafood in the mangrove area and often call the village head and men to arrest violators. Also, when we see people from other provinces clearing mangroves, we ask them not to. But when it comes to government and project meetings on forest protection and payments for patrolling mangroves, we're not included which I think's unfair."*

Finally, according to most government stakeholders and local people interviewed, state and non-state initiatives take a "carrot and stick" approach. Incentives offered to local people include financial incentives (e.g., payments for planting and protecting mangroves), while disincentives include bans on mangrove destruction activities such as clearing forests for aquaculture and poaching. Fines of VND 50,000 per tree are imposed on illegal logging for a first-time offence but increase to an additional 2 million for each subsequent violation, with fines of VND 50,000–100,000 for each log. Fines for cattle grazing are VND 300,000 per incident, while government officers will destroy any implements or equipment used to damage mangroves. Furthermore, according to government agency staff interviewed in all provinces, current projects (both government and foreign funded) are impeded by a lack of clear and well-enforced monitoring and evaluation mechanisms, which leads to low local compliance. Around 60% of households surveyed claimed their project-related jobs were never terminated, even if they failed to deliver what was stipulated in their contracts, and local authorities do not enforce the law. Similarly, 50% of younger men in Thuong village claimed that although villagers are paid to conduct patrols two to three times a week, they invariably fail to do so. Also, penalties are low, and although the law requires violators to plant new mangrove forests, there is no enforcement of this. Moreover, although commune people's committees do issue local regulations prohibiting logging, according to one young member of a women's group interviewed in Bon village, community members still violate these regulations. Although FGD participants in Bon village said they were unaware of the government regulations, government officials said they had disseminated information about government policies, but local people were not complying with the rules.

DISCUSSION

A global review on the status of mangroves has shown that global mangrove dynamics are driven primarily by human and economic activities including pollution, over-extraction, and conversion of mangroves to aquaculture (Friess et al., 2019). This study's findings mirror this at both the national and provincial levels. Our study also echoes the global findings of Friess et al. (2019) where mangrove loss has slowed in recent years, and although some drivers, like firewood collection, are no longer a threat in our study sites, key drivers like aquaculture and infrastructure, which are rooted in national development strategies, continue to pose a threat to mangroves.

Our paper also shows that in similar fashion to other countries (Primavera and Esteban, 2008; Richards and Friess, 2016), despite large numbers of government and international conservation programs, for several reasons these have failed to address the drivers of mangrove deforestation successfully. This paper also shows the failure of many mangrove planting projects, and as **Figure 3** demonstrates, the area of mangroves in Vietnam has remained stable rather than increasing. Our findings demonstrate that both government and international projects only aim to address a sub-set of drivers (and often the easiest ones) while overlooking aquaculture as a key driver of deforestation (Dat and Yoshino, 2013; Pham et al., 2019b). Aquaculture is the key driver of mangrove loss not only in

Vietnam but in many other countries in the Asia Pacific region (Richards and Friess, 2016) and globally (Ahmed et al., 2018; Bosma et al., 2020). Without addressing this key driver of mangrove loss, pressure on mangroves cannot be mitigated. Our study also supports previous research showing that mangrove conservation interventions are not always effective because drivers of mangrove loss are often associated with national economic goals, like converting mangroves for aquaculture and agriculture production, and are not well addressed by policy interventions (Richards and Friess, 2016; Chowdhury et al., 2017; Thomas et al., 2017). The transformational changes required to address drivers effectively need to combine technical solutions and address the power relations and interests that drive forest loss (Gregorio et al., 2015; Moeliono et al., 2017). More specifically, they need to address the challenge posed by national and provincial aquaculture and development goals taking precedence over mangrove conservation, and national and international projects tending to overlook this.

Our findings show that surveyed households and FGD participants across the study villages commonly see government policies on expanding aquaculture and infrastructure as key drivers of deforestation and degradation. This suggests that addressing drivers of mangrove deforestation and degradation requires holistic national strategies. Our findings also show households, FGD participants and key informants perceiving the importance of each driver differently. While poverty and migration were cited in most FGD meetings as being major drivers of mangrove loss, only small numbers of key informants and surveyed households referred to these issues. This is probably because despite drivers of mangrove loss being common across sites, each village has its own socio-political context and hence some drivers are more site specific. This suggests that national mangrove conservation policies need to be adapted and tailored to take specific local conditions into account, and should consider different stakeholders' perceptions of existing problems and how they can be addressed.

This paper also reveals that policies and projects put strong emphasis on, and incentivize, the replanting of mangrove forests, but have not provided sufficient incentives for local people to protect existing mangrove forests. Earlier research has shown that existing forests can help countries to mitigate and adapt to climate change, but this is often overlooked in current forest protection mechanisms and financing, and therefore might threaten their long-term conservation potential (Funk et al., 2019). As our paper has shown, planting new forests might not always be successful. Like other countries, despite Vietnam receiving both government and international support to plant and protect mangroves, not all projects are successful due to low survival rates (e.g., only 10–20% in the Philippines) resulting from inappropriate site and species selection (Primavera and Esteban, 2008). Therefore, keeping existing forests healthy is essential (Overpeck and Breshears, 2021; University of Michigan, 2021). Future policies should promote both stabilizing existing mangrove forests and preventing mangrove deforestation.

Our paper also shows that most programs aim to pay for local labor costs as a part of reforesting or patrolling activities. However, these programs often lack sustainable financing (Jhaveri et al., 2018). Moreover, stakeholders have different views on how mangroves can be better protected in Vietnam (Hoang and Takeda, 2015). While government agencies see mangrove conservation as a technical matter, local communities see mangroves as providers of aquaculture—their main income source. Understanding local interests is key to designing well-implemented policies. To encourage people to plant mangroves, several authors have suggested combining monetary payments with in-kind support such as training and providing access to green markets, which as our study shows, were perceived by local people as more important than financial support. This is also because the payments offered by existing programs and projects are low and are unattractive to local people. FGD participants and household interviewees in all six villages said payments should at least equal potential earnings from other land uses. Many studies also show that support for local communities, such as establishing local small-scale fishery processing industries combined with ecotourism, clarifying land tenure and supporting forest land allocation to local communities, could help reduce poverty and enhance the effectiveness of mangrove conservation (Primavera, 2000; Santos et al., 2017). However, the sustainability of any scheme would also depend on sustainable finance.

Our paper also supports other studies in showing that the effectiveness of mangrove conservation programs depends on equitable benefit-sharing mechanisms and secured tenure where local people can feel their ownership over and responsibilities toward mangroves (Datta et al., 2012; Nguyen, 2014). Without secure rights and ownership, local people's commitment toward mangrove conservation will remain low. Our paper supports previous studies that have highlighted the critical importance of involving local people in participatory decision making (Walters, 2004; Datta et al., 2012; Santos et al., 2017) based on adequate understanding of and addressing existing power dynamics, full recognition of forest people's rights, and ensuring procedural, distributive and contextual equity (Pham et al., 2014b, 2021). However, the presence different actors (men, women and indigenous people) neither fully explains the process and dynamics of participation (Marochi, 2010) nor ensures successful policy and project outcomes (Cornwall, 2008; Vatn and Vedeld, 2013). The extent to which policies and projects can increase local participation in mangrove conservation also depends heavily on the capacities of local actors, as without the skills and resources to engage with local government structures, community participation can quickly become tokenistic (Hegga et al., 2020). Leadership capacity and elite capture, particularly at the local level, can undermine local participation in mangrove conservation (Agarwal, 2000, 2001, 2009; Pham et al., 2012; Kahsay and Medhin, 2020). Mangrove conservation policies also need to avoid "top-down" approaches with externally driven rules that fail to incorporate existing local norms and preferences (Orchard et al., 2015; Lau and Scales, 2016). We also found that local people view equitable benefit sharing and access to mangrove resources and information as important enabling conditions for their involvement and commitment to mangrove conservation. However, as we discovered, when only powerful and elite groups can access information and benefits from international and national programs, and forest resources are

fully managed by government agencies (Hue and Scott, 2008; Hoang and Takeda, 2015), in the absence of other incentive mechanisms, this weakens interest in local communities to protect mangroves (Ha et al., 2012). Further, our paper shows that mangroves play an important role as a source of income for women, and women's unions can play an active role in mangrove conservation projects. Currently however, such projects limit opportunities for women to benefit, as schemes typically provide forest protection contracts that mostly pay men to patrol forests. Our paper also shares similar findings with a previous study by Hue, 2006 showing that the privatization of land in coastal areas would exclude the poor and women from accessing mangrove resources, which would greatly affect their incomes. Both men and women benefit from the conservation of mangroves (Bagsit and Jimenez, 2013; Treviño and Murillo-Sandoval, 2021), but amongst other factors, appropriate and equitable benefit-sharing mechanisms, and empowering women in policies and project design and implementation are required to enable women to take part in and benefit from mangrove conservation schemes (Barrero-Amórtegui and Maldonado, 2021). A gendered mangrove conservation approach is also essential for ensuring mangrove policies and projects understand and take into account both men's and women's interests and concerns (Feka et al., 2011; Bosold, 2012; Pearson et al., 2019) as well as ensuring good mangrove forest governance (Feka, 2015).

CONCLUSION

Our paper shows that mangroves in northern Vietnam have been destroyed as a result of economic development, local incomes from exploiting mangrove resources, clearing for aquaculture production, migration, poverty and water pollution. With an increasing understanding of the need to protect mangroves, the Government of Vietnam and foreign projects have put national and international policies and projects on mangrove conservation in place. There are no differences in the opinions of men and women or between different ethnicities in regard to drivers of mangrove deforestation and degradation, however, women are more vulnerable to the privatization of aquaculture production areas.

The effectiveness of mangrove conservation policies and projects depends on how well they can address drivers of mangrove deforestation and degradation. As these drivers are often driven by national development goals and other sectoral development needs with ministries competing for budgets and influence, holistic land-use planning needs to be coupled with effective coordination and clarification of responsibilities between government agencies, and coordinated and consistent policies concerning these natural resources. Addressing these underlying governance issues is far more important for mangrove conservation and restoration than merely offering financial incentives as various national and international projects have attempted.

In addition, policies need to pay attention to and incentivize both mangrove replanting and the conservation of exiting mangroves by providing technical support for planting and training on sustainable livelihood options for local people. Sustainable financing is essential, as are well-enforced policies, and accountable and transparent distribution of benefits and rights to stakeholders involved in mangrove protection. Gender sensitive policies and projects that take gendered differences into account in their policy interventions are important to ensure good governance. Previous projects can offer lessons for future programs, particularly on how to align local people's interests with the intended objectives of mangrove conservation projects, and on the effective use of both incentive and disincentive mechanisms.

DATA AVAILABILITY STATEMENT

The data are not publicly available as they contain information that could compromise research participant privacy/consent.

ETHICS STATEMENT

Ethical review was approved by local government authorities which are Department of Agriculture and Rural Development of Thanh Hoa Province, Forest Protection Department of Thanh Hoa Province, Forestry Department of Thanh Hoa Province, Forest Protection and Development Fund of Thanh Hoa Province, Department of Agriculture and Rural Development of Thai Binh Province, Forest Protection Department of Thai Binh Province, Forest Protection Department of Quang Ninh Province, and Tien Yen Protection Forest Management Board and Dong Rui Commune People Committee. The participants provided verbal informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TP: conceptualization, methodology, formal analysis, resources, writing—original draft, and supervision. TV: conceptualization, methodology, validation, resources, editing, and supervision. TH and TD: investigation, formal analysis, data curation, and visualization. DN, DP, LD, and NH: investigation. VN: investigation, software, and data curation. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/ffgc.2021.709073/full#supplementary-material

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