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Research Article

Does tree planting change minds? Assessing the use of community participation in reforestation to address illegal logging in West Kalimantan

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Abstract

Gunung Palung National Park in West Kalimantan, Indonesia has been persistently threatened by illegal logging for the past several decades. Subsequent fires have led to the encroachment of noxious grasses such as *Imperata cylindrica,* which have arrested succession to secondary forest within and around the park. Since 2009, local NGO Alam Sehat Lestari (ASRI) has reforested 20 hectares of degraded *Imperata* grassland within the park, with the goal of restoring forest area and decreasing the incidence of illegal logging inside the park by providing jobs and income to local people. In February 2013, a survey was conducted to assess the social impacts of the reforestation program, and to test the hypothesis that participation in reforestation can reduce instances of illegal logging through two pathways: (1) economic improvement for participants; (2) altering perceptions towards illegal logging. Structured interviews were conducted with 50 local residents, one-third of which identified as former illegal loggers, to gauge their perceptions towards forest conservation and illegal logging. The survey found that 80% of respondents believed that the reforestation program helped to reduce illegal logging in the park. However, the pathways through which this change occurred were different from those hypothesized. There was little evidence supporting the "perceptions change" pathway, but greater evidence supporting the "economic improvement" pathway through the medium of skill-building rather than direct economic improvement. Approximately 50% of participants reported engaging in self-directed tree planting activities post-involvement. These results suggest that forest restoration can effectively be used as a community-engagement tool to address illegal logging.

Keywords: Reforestation; Illegal-logging; Southeast Asia; tree planting; community engagement

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Introduction

As Indonesia's forestry sector continues to decline, protected areas such as national parks face increasing pressure from illegal logging in the absence of legal sources of timber [1,2]. As a result, deforestation continues to occur in protected areas in Indonesia [3]. Tens of millions of cubic meters are lost to illegal logging each year [4] costing the Indonesian economy between US $1-5 billion annually [1,5,6] in the form of lost royalties and national tax revenue and smuggling of merchantable timber [7]. In addition to causing the loss of valuable environmental services, illegal logging generates illicit wealth that fuels social conflict and widespread corruption [7].

Gunung Palung National Park is a 90,000 ha protected area in West Kalimantan that has been degraded by illegal logging over the past several decades. The national park hosts an estimated population of 2,500 orangutans [8] and a number of other rare and endangered species, including gibbons, clouded leopards, palm civets, crested fireback pheasants, great argus pheasants, and eight species of hornbills [9,10]. Between 1988 and 2002, 38% of the park's lowlands and 70% of the 10-km buffer zone surrounding the park was deforested through intensive logging by timber concessions; in Kalimantan, such concessions typically operated legally within buffer zones, and later illegally expanded beyond concession boundaries into protected areas [2]. It is estimated that a total of 12,384 ha was lost between 1992 and 2004, or 13% of the park's formally designated total area [3]. Although most of the industrial timber concessions that contributed to the logging around the park in the 1980s and 90s have since expired, the withdrawal of these companies combined with population growth and the expansion of palm oil has reinforced pressure on the national park.

The withdrawal of timber concessionaires was followed by the emergence in the 1990s of what has been termed "community-based logging" around Gunung Palung national park. During this period, local teams of community loggers exploited residual forest stands that were too heavily degraded for timber concessionaires to economically log [12]. By the late 1990s, an estimated 80% of households obtained more than half of their cash income from logging [12]. More recent surveys conducted by the local NGO Alam Sehat Lestari (ASRI) found that the number of households involved in illegal logging had declined to about 33% as of 2008 and less than 10% as of 2012 [11]. Of these households, 77% made more than one-half of their income from logging, but 100% indicated that they would prefer alternative fields of work to logging. These findings suggest that the illegal logging problems around Gunung Palung may not be as intractable as they have been historically, and can theoretically be addressed through provision of alternative livelihoods to active loggers.

Alam Sehat Lestari (ASRI) is a local NGO which offers both health and conservation-oriented community development programs targeted towards reducing illegal logging in the park. In 2009 ASRI initiated a reforestation program that employed local community members to plant trees in degraded areas within Gunung Palung National Park, with the end goal of generating data on restoration of tropical forest areas using native tree species. Between 2009-2013, 21 ha of arrested successional *Imperata cylindrica* grasslands were reforested through high-density plantings of seedlings representing over fifty different local species, the results of which are currently being drafted for publication. The reforestation site is located within the boundaries of the national park, where it was deforested through overcutting of a neighboring timber concession in the 1980s and later used by community members for keeping home gardens. Since ASRI began operating on the site in 2009, no community conflicts have taken place

regarding tenure and future use of the trees. The reforestation program has enjoyed widespread local support from community members, many of whom are typically employed by the program during the annual planting season.

After several years of operation, ASRI began exploring the role of reforestation in the results chain that leads from development intervention to reductions in illegal logging. In considering this issue, ASRI hypothesized that there were two pathways, or channels of influence, through which community involvement in reforestation activities might lead to reductions in illegal logging: (1) changed perceptions, e.g. alteration of the perceived value of forest resources and the social acceptability of illegal logging, which would then lead individuals to cease logging or place pressure on others to cease logging; (2) economic improvement, e.g. provision of an alternate source of income that allowed individuals to cease logging, or provision of skills that led to improvements in economic well-being and reduced dependence on logging.

There have been very few academic studies conducted on local behavior and perception change associated with reforestation that can validate these hypotheses or suggest alternative pathways of influence. Many studies have instead focused on assessing local attitudes and motivations for engaging in reforestation or tree planting activities. Community members are often motivated for a variety of environmental purposes, which include improving the quality of soil and water, increasing the presence of wildlife, restoring forests, and improving the climate [19-22]. Tree planting or reforestation has also been documented as a strategy for securing land tenure in many cultural contexts [15-18]. Two studies respectively from Uruguay and Chile identified positive local attitudes towards establishment of tree plantations that made use of unproductive cattle ranches or contributed to biodiversity conservation [13,14]. While these studies identified reasons for positive attitudes towards reforestation, none have directly explored the impact that reforestation has had on the individuals motivated to participate in tree planting activities, nor whether this involvement led to long-term behavioral change.

This is a potentially enlightening line of inquiry considering the high incidence of failure in reforestation projects around the world due to lack of consideration for local socio-economic dynamics. The social impacts of reforestation are relatively less understood; few, if any studies, focus on behavioral and perception changes experienced by the actors involved in reforestation programs, and the possible implications this has for conservation. New opportunities and insights may emerge when initial steps are taken to understand the needs and interests of local people, and how this may affect the design of reforestation programs [19].

Methods

ASRI's reforestation program is located in a village of 764 households, where it has directly employed nearly one-hundred villagers between 2009-2013 as nursery staff, seasonal reforestation workers, day laborers, and fire protection crews. Upwards of 300 additional villagers have attended annual reforestation education events, creating a pool of over 400 individuals that have been involved in reforestation efforts. A survey of these villagers was conducted in February 2013, in which semi-structured interviews were conducted with 50 residents, 75% of whom had prior involvement in reforestation efforts ("Involved"), and 25% of whom had no prior involvement with reforestation ("Not Involved"). The sample included relatively balanced representation from all age groups. While effort was made to survey both genders, greater emphasis was placed on surveying a representative sample of former workers, most of whom are male.

The sample of "involved" participants was chosen randomly from a list of all the contract workers that were hired between 2009-2012. The sample of "not involved" participants was obtained through visiting every third house in the two main sub-village clusters (*dusuns*). Ten percent of the total sample (n=5) consisted of local politicians and community leaders whose support was necessary to obtain in order to conduct the study. Our ability to collect a larger sample of interviews was constrained by the limited availability of residents due to the rice harvest and inclement weather conditions that rendered several portions of the village inaccessible.

Interviews were conducted in the homes of respondents in the afternoons and evenings. In cases where multiple workers lived in the same house, they were interviewed separately. Interviews were conducted in Bahasa Indonesia and followed a semi-structured format, consisting of a mixture of closed and open-ended questions with the goal of mimicking a natural conversation in order to make the respondents feel more comfortable. When clarifications were requested by respondents, local research assistants re-translated the question into the local language, a dialect of Bahasa Melayu. The interviews lasted between 15-60 minutes, and also included the collection of basic socio-economic data, such as household size and primary occupations and sources of income.

Given the sensitivity of the topic of illegal logging, three terms were tested in the survey pre-test: *illegal logging* (the English term is widely understood), *perambahan hutan,* and *penebangan liar*. The latter term, *penebangan liar,* was found to be the easiest for respondents to understand. The term *illegal logging* carries the connotation of organized forest crime, while *penebangan liar,* can also refer to commonplace tree cutting to fulfill household needs for firewood and construction timber.

Several strategies were used to gauge perception change, based on the assumption that respondents may not themselves be aware they had experienced perception changes. These strategies included:

(1) Comparison of responses to basic questions regarding the state of illegal logging in the national park. These questions were all followed up with further probing questions to elicit the reasoning behind respondent opinions. Responses were compared within a "Involved in Reforestation vs. Not Involved in Reforestation" group, and a "Logging vs. Non-logging" group in order to gauge differences in perceptions and reasoning between these different groups.

(2) Eliciting narrative responses regarding involvement. Participants were invited to share the story of their experience with reforestation, their motivation for involvement, their aspirations regarding the national park, etc. The pre-test of the survey found that use of open-ended questions to elicit long narrative responses yielded more useful data than close-ended questions. Responses were later coded for evidence of perception changes, and respondents were accordingly assigned binary values indicating whether or not a perception change occurred.

(3) Employment comparison. Respondents were asked to describe their livelihood situation before and after involvement in reforestation, and to compare the two fields of work. This last question was open-ended, and respondents provided a colorful variety of comparisons related to salary, skill building, travel time, physical comfort, morality, and more. This further helped to elicit information regarding perceptions towards forest resources and illegal logging.

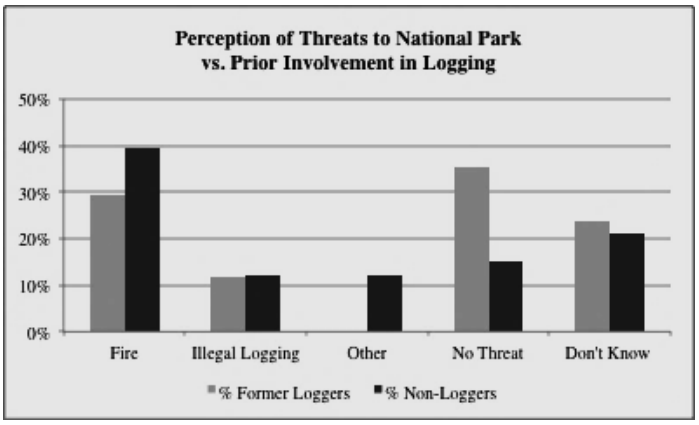
Use of these three strategies helped to cross-check responses, and mitigate bias in cases where respondents may have provided responses they believed the interviewers wished to hear, or did not respond to one of the strategies. Responses from the first strategy were analyzed using statistical software to conduct a series of chi-squared tests, while responses from the second two strategies were transcribed and coded according to keywords and themes that emerged.

Results

Comparison of Perceptions

A series of closed-ended questions were asked regarding threats to the national park and the current status of illegal logging. Respondents were first asked, "What is the biggest threat to the national park right now?" and provided with sample answers, including: fire, illegal logging, palm oil, natural disasters, etc. Interestingly, many respondents answered that there was "no threat", even though this was not listed as a possible response. Figure 1 below details the difference in responses between groups.

a



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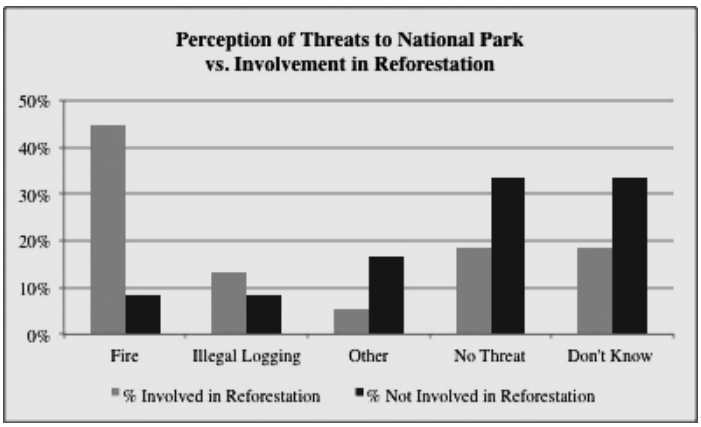
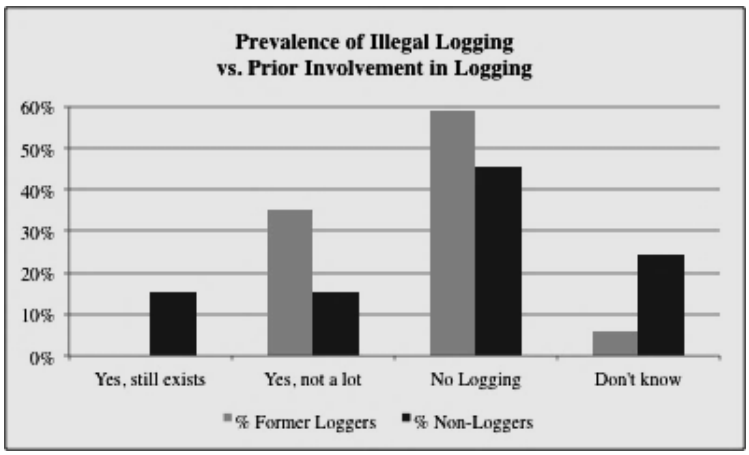


Fig. 1. Perceived Threats to the National Park

On first glance, those involved in ASRI reforestation efforts appeared more likely to articulate a specific threat (58%) compared to those not involved, who were more likely to say there is no threat, or they don't know (66%). However, this relationship was found not to be significant ($\chi2=3.247$, df=1, p=0.07155), nor was the relationship between threat perception and former involvement in illegal logging ($\chi2=2.297$, df=1, p=0.12962). The most common cited threat to the national park was fire (36%), while most other respondents said there was no threat (22%).

Secondly, respondents were asked what they thought the status of illegal logging was within their village, and responses were coded as: (1) Yes, still exists, (2) Yes, but not a lot, (3) None at all, and (4) Don't Know. Only 9 respondents declined to answer this question; this lack of knowledge was independent of association with the project ($\chi2=0.0003$, df=1,p=0.98). Respondents were not asked to elaborate on their responses, although 30% of them did so voluntarily. These responses were analyzed and grouped into the categories outlined in Table 1. Figure 2 below compares responses from people who were and were not involved in ASRI's reforestation activities, and with former loggers and non-loggers.

a



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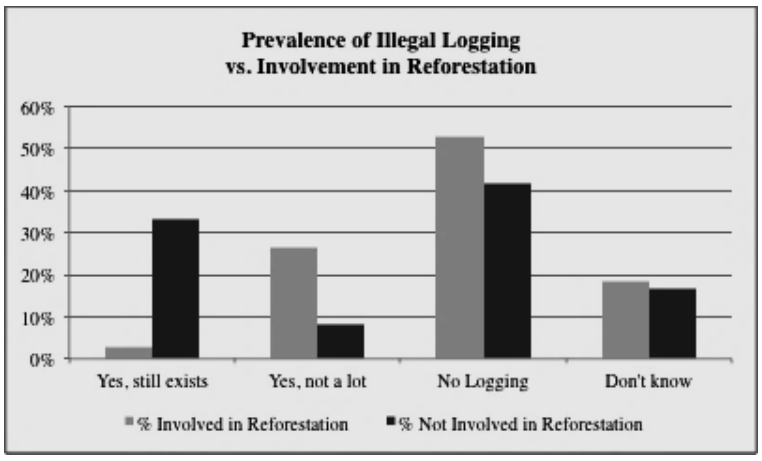

Fig. 2. Status of Illegal Logging vs. Involvement and History of Logging

Overall, 50% of respondents believe that there is no longer any illegal logging occurring in the community. In all groups, roughly 30% of respondents believe that some form of illegal logging still exists, although this is highest among those not involved (41%). Involvement in the reforestation program was found to be correlated with perceptions of decline in the amount of illegal logging, while respondents who were not involved were more likely to believe that logging was still ongoing ($\chi 2=14.58$, df=2, $p<0.001$). However, this significance disappeared when a log linear model was used to control for location (sub-village of origin). This suggests that spatial factors, such as where a respondent lives, were a stronger predictor of perceptions of illegal logging than involvement.

We also tested to see if involvement in reforestation was associated with evidence of perception change that emerged during coding of the narrative responses. It was found that only respondents who participated in the reforestation program expressed any evidence of change in their thought towards illegal logging and conservation of the national park ($\chi 2=5.756$, df=1, $p=0.016$).

Thirdly, an overwhelming 80% of respondents agreed that the presence of the reforestation program had reduced occurrences of illegal logging within the national park. While we had initial concerns that this question would attract agreement-bias, it was found during the pre-test and then again during the actual survey that respondents were extremely emphatic about their answers to this question. So the question was kept in the survey, largely as a prelude for the follow-up question "Why do you think that way?", 60% of respondents were able to articulate their reasoning, which provided insight into the local dynamics driving illegal logging in the area. Their responses were analyzed and grouped into categories (Table 1).

Table 1: Reasons for Reduction in Illegal Logging

Potential Explanations for Reduced Illegal Logging	n	%
1. Presence of an NGO	10	20%
2. Availability of an alternative field of work	7	14%
3. External factors unrelated to reforestation	7	14%
4. Reforestation yielded results (less fire, less logging)	4	8%
5. Education: reforestation taught people about the forest	2	4%
6. No reason given	20	40%
TOTAL	**50**	**100%**

The most common response was that the presence of ASRI helped (20%). Respondents gave reasons such as, "Since ASRI came, the forest never burns because there is control," and "After there was ASRI, the people had hope." However, 14% of respondents raised the point that other factors have reduced illegal logging, such as alternative employment in oil palm plantations. The plantation's entry into the village has undeniably provided an alternative, stable source of income. Law enforcement is another influential

factor; residents are afraid to enter the forest for fear of being apprehended by the National Park's forest patrols. It is very interesting that these influential factors appeared in only 14% of responses; in contrast, 46% of respondents cited the reforestation program as the chief explanatory factor in illegal logging reduction.

Narrative Responses

From the coding of narrative responses to questions regarding experiences with the reforestation program, three strong themes of perception change emerged:

1. Feeling of empowerment from having gained new skills and experiences (19%)

All participants gained skills and experience, but many of them expressed that this led to increases in personal confidence and feelings of professionalism that they would not have gained in other fields of work. Some sample responses that were coded under this theme include: "From measuring activities, I learned how to work with discipline. Other types of work are not like that," and "Before, I used to be too shy to talk to people with higher education, but now I am not shy to talk at all."

2. New appreciation for the forest (17%)

Several respondents expressed that they came to view the forest differently; the act of planting trees caused them to think differently about trees in natural settings. Sample responses coded under this theme include: "I was happy to see the area change from alang-alang (*Imperata cylindrica*) back into forest," and "Before, my way of thinking was narrow. But after one year, two years, three years, as the trees got taller I grew to like them more. I came to feel close to them, and felt they were a result of my work."

3. Realization of what effective conservation interventions can accomplish (8%)

Many participants expressed frustration with previous development and conservation interventions conducted by NGOs, local and national government, and international organizations. Their responses indicated that the reforestation program provided a positive example of an effective conservation program, which has caused them to view these other interventions in a different, more critical light. Sample responses include: "I did not agree with [the other organization's] methods… It would have been more effective if they gave the money directly to the people here."

Economic Improvement

Common primary occupations of respondents include farming (rice, vegetables), palm oil plantation workers, rubber plantation workers, daily wage laborers, and construction. A small percentage is also permanently employed by the national park as reforestation workers or forest patrols. While the sample size is not large enough to draw any meaningful conclusions about changes in employment patterns, it did reflect the general trend observed by field staff that many farmers and rubber plantation workers have shifted to work at the oil palm plantation. When asked to compare reforestation as a field of work with their current occupations, several themes emerged which are described in Table 2.

On the whole, 31% of responses negatively compared reforestation to other work (less stable, lower salary), while 52% made favorable comparisons (gain new experience, easier workload, supports existing lifestyle). The most significant theme was that of gaining new skills and experience. One respondent illustrates the sentiments of this category: "At the rubber plantation, I didn't experience anything at all.

The experiences with reforestation have been incredible – I can meet people from other countries, learn about the different types of trees, and gain more professional skills." The finding that this was the dominant category related to sentiments of reforestation as a field of work supports the dominant perception change theme expressed earlier related to increased confidence from skill building.

Respondents were also queried as to whether they had become involved in any other types of conservation activities following their involvement in the reforestation program. The main finding was that 68% of involved participants have since engaged in self-initiated tree planting activities. Although their primary choices of tree species (durian, rambutan, rubber) makes it difficult to directly attribute reforestation involvement to tree planting, given that these trees are commonly planted, several respondents did directly note that they used the techniques they learned from reforestation work (planting methods, seedling care, fertilizer application) in raising these seedlings.

Subsequent types of conservation activities that participants reported involvement in include engaging in voluntary fire suppression activities, securing employment in the national park's reforestation program, advising fellow community members on tree planting activities, and becoming involved in other NGO conservation programs.

Table 2. Comparing reforestation with other occupations

Perceptions of Reforestation Work	**n**	**%**
Gain more skills and valuable experience	7	18%
Ethically superior to other options	6	16%
Workload is physically easier	2	5%
Safety net to support existing lifestyle	5	13%
No difference	6	16%
Lower salary than other work	5	13%
Not a stable source of income	7	18%
TOTAL	**38**	**100%**

Discussion

Initial hypotheses considered two potential pathways through which involvement in reforestation could lead to reduced illegal logging: (1) The "Perception Change" pathway, in which participation in reforestation activities changed perception towards forest resources and the social acceptability of illegal logging; and (2) The "Economic Improvement" pathway, in which participation provided an alternate source of income or job skills that allowed people to shift away from logging.

Responses yielded little evidence supporting existence of the "Perception Change" pathway. Overall, only 31% of involved participants expressed sentiments that could be construed as perception changes. Given the potential sensitivity of the topic, it is possible that this survey failed to capture sentiments that are indeed held by community members. It would be beneficial if this survey was followed up with a detailed ethnography in the future in order to capture a more nuanced picture of the relationship between the

community, the reforestation program, and the continued presence of forest crimes. However, regardless of whether or not perceptions towards forest resources or the social acceptability of illegal logging have been changed by involvement with conservation programs, the data indicates that perceptions of forest resources do not play a strong role in influencing logging compared to economic reasoning. Narrative responses to the questions related to local drivers of illegal logging suggested that employment, availability of raw timber, and fear of legal punishment are stronger incentives to stop logging.

If we consider increased awareness to be a form of perception change, the data does support that assertion. Involved participants were more likely to be able to articulate specific threats to the national park, specific aspirations regarding the future of the park, and articulate reasoning explaining the status of illegal logging within the national park. The narrative responses identified a greater appreciation for the forest, awareness of the forest's fragility and desire to preserve it for future generations. The next step towards validating this pathway is thus – does perception change, in the form of increased awareness, translate into action? Again, there was little evidence to support this based on anecdotal data contained within the narrative responses. Several respondents expressed that awareness does not translate into open discussion. There is little communication or discussion within the community regarding conservation issues, and even those closely involved in the reforestation program admitted to never raising conservation issues with their friends and neighbors. Frequent socializations are needed in order to move from the awareness-only stage towards the formal and informal discussion stage that has the real potential to cast illegal logging as a socially unacceptable activity.

However, these findings do not imply that the reforestation program has failed to reduce illegal logging through other pathways. Rather the data suggests that there is evidence of an "empowerment pathway" through which individuals are able to improve their own economic situations via the skills and experience they gained through the reforestation program. This is supported by the data that 68% of involved participants engaged in self-directed tree planting activities, as well as the number of individuals who later found employment in the reforestation programs of the national park, local NGOs, or even in the seedling nursery of the palm oil plantation. The data also suggests that this empowerment was more valuable to the community than the temporary flow of income through reforestation employment. Respondents praised the support that ASRI provided to the community and the positive example of conservation set by the program, suggesting that the presence of an organization with tangible activities itself is a powerful source of motivation and inspiration for the people.

The sense of empowerment generated can also reduce the social acceptability of other forms of work in addition to illegal logging, as individuals become dissatisfied with the level of stimulation and knowledge accumulation in other fields of work. This is supported by individual responses that narrated feelings of boredom working for mining companies and refusal to get involved with other development projects that did not meet the same high standards. This in itself can be construed as another type of perception change towards the acceptability of certain livelihoods rather than towards natural resources.

Regardless of the lack of evidence displaying widespread changes in perceptions, the prevailing positive sentiments of the community towards the reforestation program and the evidence of community benefit paints a different picture than many of the examples illustrated in the literature. Reforestation has been described in the academic literature as a coercive strategy employed by the state to claim authority over

forest estate and bring greater areas of land under state control [23,24,25]. Throughout Asia, many cases have been documented where local communities have destroyed newly reforested areas that impinged upon local property regimes, took away potential agricultural land, or failed to provide incentive to maintain seedlings [25,26,28,29]. In the Philippines, reforestation sites have been burned down by communities driven by the perverse incentive to get paid for planting more trees [29]. A reforestation project in the buffer zone of a national park in Uganda evicted communities from the area they inhabited, prompting retaliation by setting fire to a 4km strip of reforested Eucalyptus demarcating the boundary between them and the land they were evicted from [26]. Another study found that reforestation activities under Vietnam's Five Million Hectare Reforestation Project exacerbated socio-economic divides in one community by reforesting an area that the poorest households depended upon for collecting fodder [27]. In sum, both successful and failed reforestation efforts have been documented to cause negative socio-economic impacts not limited to land-use conflicts, forced evictions, and exacerbation of poverty. Understanding the relationship between local communities and reforestation is crucial to the success of conservation efforts that have reforestation components. This study sought to assess aspects of this relationship, with the goal of identifying pathways through which a reforestation program could impact local community members in a way that catalyzed behavioral change and resulted in the positive conservation outcome of reduced illegal logging.

Implications for Conservation

The overwhelming majority of respondents believe that the reforestation program has greatly helped to reduce illegal logging in Gunung Palung National Park. However, contradictory responses given in relation to the reforestation program's effect on illegal logging, as well as explanations for the current status of illegal logging, suggest that respondents may have conflated the impacts of the reforestation activities with the impacts of other external influences. Increased patrolling efforts by national park staff and the arrival of the oil palm plantation, which has provided both jobs and a source of timber, clearly play a strong role in reducing the social acceptability of logging, and addressing the economic incentives related to demand for employment and raw timber. Although several respondents specifically clarified that the reforestation program that began in 2009 had already helped to reduce illegal logging before the oil palm company arrived in 2011, it was beyond the ability of the survey to pick apart the impacts of reforestation and the oil palm plantation.

What is more important is that this survey has provided a detailed picture of local socio-economic drivers of illegal logging, and in doing so identified an urgent need to create a legal source of timber in the vicinity of the national park. Some village leaders predict that within 1-2 years, the supply of salvage timber will be depleted, and the oil palm plantation will begin to reduce its workforce once the initial labor-intensive phase of plantation establishment has ended. There is a genuine concern amongst the village residents that illegal logging will return to the National Park again when this happens. This sentiment reinforces the general recognition amongst respondents that the community is still focused more on fulfilling economic needs than considering the impacts of their activities on the forest – which further detracts from the perception change theory, because it suggests that any emergent conservation ethic generated by involvement in reforestation will not survive in the face of economic pressure.

One possible solution is that the community currently has applied for *hutan desa* (Village Forest) status, which would provide them with legal recognition over an additional portion of forest which could potentially be planted with timber trees and function as a future source of timber. However, this application is still pending and there are concerns that in the absence of legal recognition, portions of the village forest can still be allocated to concessionaires through the district spatial plan. Reforestation or rubber tree planting activities on privately held land outside the park are another potential avenue for creating a legal source of timber or alternative livelihood. Future development interventions in the area surrounding Gunung Palung National Park should focus on helping to develop a long-term economic solution to prevent a relapse of illegal logging within the park.

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