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Rural Electrification in Indonesia: The Role of Micro Hydro Power in Shaping Forest Conservation Behavior^a

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ABSTRACT

It is reported that villagers at the villages electrified by micro hydro power (MHP) show more favorable attitudes, intentions, and behaviors toward forest conservation. They initiated a community-based agreement regulating forest cutting, reduced trees chopped from the forests, reduced intention toward forest cutting, and even participated in reforestation. The present study is supposed to test this phenomenon and to find out which variables are determining intentions to behave more favorably toward forest conservation. The Theory of Planned Behavior (TPB) is applied to explain the behavior in question. TPB suggests that intention is the best predictor of behavior and it is determined by attitudes toward the behavior, subjective norms, and perceived behavioral control. These concepts, together with descriptive norms and past behavior, are compared between participants from a village with MHP and participants from a village with no electricity. A comparison between participants from another village with MHP and those from a village with grid electricity is also conducted.

The results reveal that MHP inconsistently predicted participants' beliefs, attitudes, norms, perceived control, intention, and behavior toward forest conservation. Participants from the village electrified by MHP for 4 years showed more concern toward forest conservation than participants from the village without electricity. However, participants from the villages electrified by MHP for a year showed less concern toward forest conservation than participants from the village, which has been grid electrified for 10 years. Regrouping the villages into electrified and non electrified villages gave evidence that rural electrification, regardless of its sources, positively shaped participants' beliefs, attitudes, norms, perceived control, intention, and behavior toward forest conservation. Regression analyses showed that intentions to behave toward forest conservation were determined by subjective norms, past behavior and educational background.

1 INTRODUCTION

The Government of Indonesia is struggling to provide sufficient and reliable energy to its people. Rural electrification is a particular issue that needs serious attention. The Ministry of Energy and Mineral Resources announced that the electrification ratio in Indonesia was 65% at the end of 2008 and has targeted 93% electrification ratio by 2025. Special attention was directed towards rural electrification based on renewable energy especially MHP which was believed to be the most popular and successful renewable energy for rural application.

^a The study is a part of the project initiated by Energy Working Group (EWG) under the Bilateral Energy Cooperation Indonesia Netherlands (BECIN).

An interesting phenomenon occurred that villagers at some near-forest villages electrified by MHP showed more concerns toward forest conservation. For example, villagers at Tanete, located in Enrekang, South Sulawesi (Indonesia), were reported to sign an agreement not to cut trees from the surrounding forests without any approval from the local authority. If forest cutting is performed, they agree to replant ten times the number of trees they have cut down. The agreement was filed at the Energy and Mineral Resources Agency of Enrekang. The phenomenon also occurred in Kerala, India and El Limon Community, Dominican Republic [1][2].

The objectives of the study were to know whether MHP would increase villagers' concerns toward forest conservation and to find out which variables predicted intention toward forest conservation behavior. The theory of planned behavior was applied to answer the questions. The study explains the research method and the results and provides conclusions at the end of the discussion.

2 THE THEORY OF PLANNED BEHAVIOR

TPB is a theory that is widely applied in explaining the relationship between behavior, intention, attitudes, and beliefs. It proposed that intention is the best predictor of behavior and intention is determined by attitudes, subjective norms, and perceived behavioral control (PBC) [3]-[5]. These three determinants of intention depend on their related beliefs i.e. behavioral beliefs, normative beliefs, and control beliefs [4]. In this case, behavioral belief refers to the salient information relevant to the behavior, normative belief refers to the likelihood that important referent persons or groups would approve or disapprove the execution of the behavior, and control belief relates to the belief about resources and opportunities acquired to perform the behavior [3]-[5]. Intention indicates how hard persons want to try and how much effort they are willing to exert in order to execute the behavior [4]. Attitude is the degree to which a person is favorable or not toward a behavior, and subjective norm is related to perceived social pressure to perform or not to perform a behavior [3]. PBC refers to the perception of the ease and difficulty of performing the behavior in question [4]. Together with intention, sometimes PBC directly predicts behavior. It depends on how easily the behavior can be performed at will and how accurate the perception of control over the behavior is [6]. TPB was applied to assess the role of MHP in shaping forest conservation behavior as it is widely supported by other researches [6]-[8].

Different people live in different physical and social circumstances. Different environments allow people to acquire different information that let them develop different beliefs about the consequences of a behavior, about the expectations of others, and about the resources and opportunities acquired to perform the behavior [5]. These beliefs may shape people attitudes, subjective norms, and PBC as the determinants of intention to behave differently. The physical and social environments act as the external variables or background factors that possibly shape the beliefs people hold [5][9]. MHP can be regarded as an external variable that may influence the way people act toward forest conservation. Some other external variables are demographic variables (e.g. age, gender, education, income, population distribution, and occupation), personality, mood, emotion, general attitudes and values, intelligence, group membership, past experience, exposure to information, social support, and coping skills [5]. In present study, the demographic variables are particularly important to consider because they may alter the effect of MHP if it exists.

To understand more roles of social influence in predicting intention, a concept named descriptive norm was added to the TPB model as suggested by some studies [10]-[12]. Descriptive norm refers to the perception of others behavior of interest, i.e. what other people do [10]. A meta-analysis study found that descriptive norms had medium to strong correlations with intention [12]. In the present study, descriptive norms were expected to explain some variance in behavioral intention.

Other studies found that past behavior had some residual effects on intention. For example, three meta-analysis studies assessing the theory of reasoned action (TRA, the antecedent of TPB) and TPB models concluded that past behavior accounted for some unique variance in intention [11]

[13][14]. Past behavior was added to the model of present study to know if it would explain some variance in intention.

Figure 1 shows the schematic of the extended TPB model. MHP and the demographic variables were regarded as the external variables that may indirectly influence intention and behavior by altering beliefs. Any adjustment or new formation of beliefs could alter attitudes, subjective norms, and PBC. These three predictors of intention could influence intention to behave positively or negatively toward forest conservation. Past behavior and descriptive norms were added to understand their effect on intention. Forest conservation behavior can be regarded as a behavioral category comprising a set of activities rather than a single action [9]. There are three salient activities promoting forest conservation behavior that were reported previously. They were the decrease in forest cutting, reforestation participation, and arranging and supporting community-based regulation on forest conservation. Due to some limitations, the study focused on one action only: forest cutting.

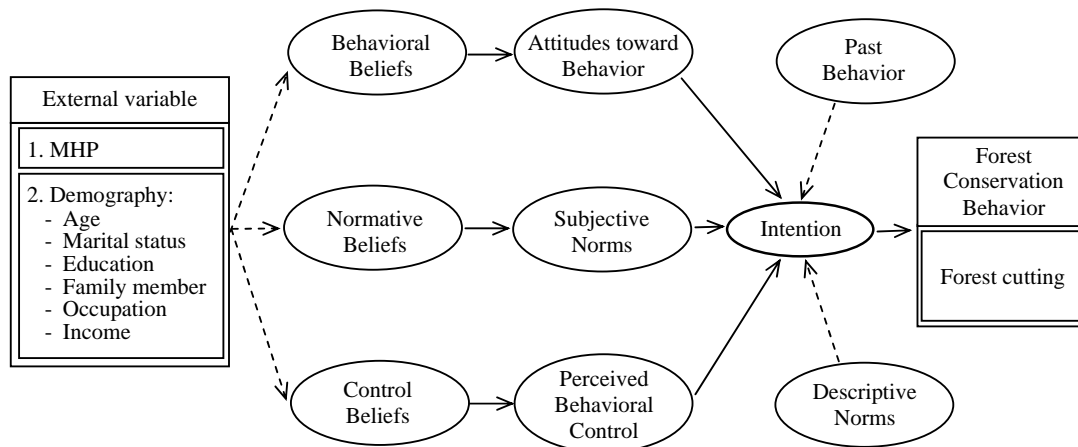


Figure 1. The schematic of the extended TPB model

3 METHOD

To measure the variables in the proposed TPB model, a self-reported questionnaire with fixed responses was employed. The questionnaires were randomly distributed to household at two villages with MHP and two villages with no MHP in rural area of South Sulawesi, Indonesia. Systematic sampling method was applied to select participants from the lists of household provided by the official village leaders. Tanete and Palakka were the MHP villages, whereas Lebani and Pasang were the nearby non-MHP villages. The villages are located in Maiwa, Enrekang District. When the study was conducted, Tanete and Palakka had been electrified by MHP for four years and a year, respectively, whereas Lebani had no electricity and Pasang had been grid electrified for ten years. Participants at Tanete were compared with those at Lebani. Meanwhile, participants at Palakka were compared with those at Pasang. 60 questionnaires were distributed at each village. The respondent criteria were male and 18 years old or above. The questionnaires were provided in *Bahasa Indonesia*, the official language of the country.

The first part of the questionnaire asked participant demographic backgrounds: their age, marital status, education, family member, occupation, and net income. The second part measured the concepts of the model. They were measured by applying a disguised technique due to the fact that questions about forest cutting could elicit responses that were socially desirable [5]. Each of the behavioral, normative, and control beliefs were measured in eight questions. Beforehand, a pilot study was conducted to find out the eight most salient beliefs about forest cutting that were held by the villagers. Behavioral beliefs were measured in questions such as “*Forest cutting helps people increase their income*” They were measured in a 7-point unipolar scale ranging from *strongly*

disagree to strongly agree. Normative beliefs were measured in questions such as “*Neighbors think that people should not do forest cutting*” measured in 7-point bipolar scale ranging from *strongly disagree to strongly agree*. Eight questions such as “*Availability of modern tools and sawing machines facilitates forest cutting*” were used to measure control beliefs in a 7-unipolar scale from *never happens to always*.

Attitudes were asked in a question: “*In your opinion, cutting trees from forests is...*” measured in five evaluative semantic differential and 7-point bipolar scales; i.e. *bad – good, harmful – beneficial, unacceptable – acceptable, unpleasant – pleasant, foolish – wise*. Subjective norms were measured in three questions: “*People’s most important others think that people should do forest cutting*” “*People’s most important others will approve forest cutting*” and “*People’s most important others want people to do forest cutting*” measured in 7-point bipolar scale from *very unlikely to very likely*. PBC was asked in a question: “*For most people around here, forest cutting is a(n)..... thing to do*” measured in three 7-point bipolar scales: *difficult – easy, complicated – simple, and effortful – effortless*. Finally, descriptive norms were asked in one question: “*How many men that you know from the village have ever engaged in forest cutting or have asked/hired others to do it?*” measured in a 7-point frequency scale from *none to all*. Intention was asked in two questions: “*In your opinion, the neighbor near you will do forest cutting within a year*” and “*In your opinion, the neighbor near you intends to do forest cutting within a year*” measured in 7-point bipolar scale from *very unlikely to very likely*. Past behavior was measured with one indirect question: “*On average, how many trees do you think a villager cut from the forest last year?*” scaled from *none, 1 to 4 trees, 5 to 8 trees, 9 to 12 trees, 13 to 16 trees, 17 to 20 trees, to more than 12 trees*. Two direct questions of past behavior were also asked: “*Did you engage in forest cutting or ask/hire others to do it last year?*” and “*Have you ever engaged in forest cutting or asked/hired others to do it?*” Only *yes* and *no* answers were provided for these questions.

4 RESULTS

Tanete, Lebani, Palakka, and Pasang are located in Enrekang District, about 250 kilometers north of Makassar, the capital city of South Sulawesi. Tanete and Lebani are about 3 kilometers away from each other and are surrounded by Bungin River forest group. They were populated by 637 and 927 inhabitants in 2009, respectively. Inhabitants at Lebani were based on population of two sub-villages. Palakka and Pasang are also about 3 kilometers away from each other and are surrounded by Bungin River forest, Pasang River forest, and Batupali forest. When the study was conducted, 675 and 880 inhabitants lived in Palakka and Pasang, respectively.

The study was conducted from 13th of April to 11th of May 2009. 236 of the 240 questionnaires were returned. However, only 182 respondents answered the questionnaire completely. The missing data were treated mostly in pairwise exclusion method to avoid losing too many data. This method ensures that if the completed questionnaire has some missing values, it will not be fully abandoned. The ages of participants ranged from 18 to 71 years old ($M = 37.4$) and 179 of them (76%) were married. Nine participants (3.8 %) did not finish elementary school, 121 participants (51 %) were elementary school graduates, 45 participants (19 %) graduated from junior high school, 49 participants (21 %) were senior high school graduates, and 12 participants (5 %) were university graduates. When the question about family member was asked, the results were four participants reported to live alone, 25 participants (11 %) lived with 1 to 2 others, 65 participants (28 %) lived with 3 to 4 others, 83 participants (35 %) lived with 5 to 6 others, 42 participants (18 %) lived with 7 to 8 others, and 17 participants (7 %) lived with more than 8 others. 215 participants (91 %) worked in agricultural sectors, 8 participants (3 %) were unemployed, and 13 participants worked in other fields. The monthly income distribution showed that 204 participants (89 %) earned IDR 500.000 (EUR 35) or less a month, 11 participants (5 %) earned between EUR 35 to EUR 70 a month, 15 participants (6 %) earned above EUR 70, and 6 participants did not answer the question.

4.1 Comparison between the Village with MHP and the Village without Electricity

Before comparing the participants based on the concepts, a principle component analysis was conducted assessing the eight variables of the beliefs. It was done to know whether those variables appropriately measured the beliefs as expected. The analysis revealed that the variables of behavioral beliefs and control beliefs could be extracted into 2 components, whereas those of normative beliefs were underlain by one component. When reliability tests were conducted, the Cronbach's alpha values of the components ranged from .702 to .952 (>.7) indicating that the variables were reliable in measuring the beliefs.

Demographic comparisons showed that only the education variable was significantly different between participants at Tanete and Lebani. With one illiterate person, 24 elementary school graduates, 16 junior high school graduates, 17 senior high school and 2 university graduates, participants at Lebani held higher education achievement than participants at Tanete with four illiterate persons, 41 elementary school graduates, 6 junior high school graduates, 7 senior high school and 1 university graduates, $\chi(2) = 14.73$, p (two-sided) = .001 (<.05). However, when its effect was tested while controlling the effect of MHP, the education variable could not explain significant variances in the concepts being compared. The other variables, i.e. age, marital status, family member, occupation, and net income, were not significantly different.

Table 1. T-test results of the concepts between participants at Tanete and Lebani

| Concepts | t | Df | Sig. (1-tailed) | Mean Difference |
|----------------------|--------|-------|-----------------|-----------------|
| Behavioral Beliefs | -.384 | 113 | .351 | 0.101 |
| Normative Beliefs | -1.371 | 111.5 | .087 | 0.256 |
| Control Beliefs | -1.866 | 109 | .032 | 0.457 |
| Attitudes | -.939 | 113 | .175 | 0.975 |
| Subjective Norms | -1.463 | 114 | .073 | 1.111 |
| Descriptive Norms | -2.988 | 114 | .002 | 0.823 |
| PBC | -2.699 | 114 | .004 | 1.702 |
| Intention | .136 | 114 | .446 | -0.083 |
| Indirect Past Behav. | .223 | 114 | .412 | -0.076 |

Table 1 shows that participants at Tanete significantly held more positive control beliefs ($M_{CB} = 0.27$, $SE = 0.19$), descriptive norms ($M_{DN} = 5.59$, $SE = 0.18$), and PBC ($M_{PBC} = 3.21$, $SE = 0.46$) than participants at Lebani ($M_{CB} = -0.19$, $SE = 0.15$; $M_{DN} = 4.77$, $SE = 0.21$; $M_{PBC} = 1.50$, $SE = 0.43$), $ps < .05$. All other concepts were not significantly different.

4.2 Comparison between the Village with MHP and the Village with Grid Electricity

The demographic comparisons between participants at Palakka and Pasang showed that the age was the only demographic variable that was significantly different in which participants at Palakka ($M = 37.78$, $SE = 1.27$) are significantly younger than participants at Pasang ($M = 42.02$, $SE = 1.44$), $t(113) = 2.212$, $p = .03$ (2-tailed). However, the age could not account for any genuine variance in the concepts being compared.

Table 2 shows that seven out of nine concepts were significantly different between participants at Palakka and Pasang. The mean difference values show that participants at Palakka, the MHP village, significantly showed less behavioral and normative beliefs, attitudes, subjective norms, descriptive norms, PBC, and intention toward forest conservation behavior (measured in forest cutting) than participant at Pasang, the grid-electrified village. The participants at both villages were not significantly different in control beliefs and indirect past behavior.

Table 2. T-test results of the concepts between participants at Palakka and Pasang

| Concepts | t | Df | Sig. (1-tailed) | Mean Difference |
|----------|---|----|-----------------|-----------------|
|----------|---|----|-----------------|-----------------|

| | | | | |
|----------------------|--------|-------|-------------|--------|
| Behavioral Beliefs | -3.488 | 111 | .000 | -0.906 |
| Normative Beliefs | -2.131 | 112 | .018 | -0.387 |
| Control Beliefs | -.687 | 113 | .247 | -0.171 |
| Attitudes | -3.290 | 111.0 | .001 | -3.794 |
| Subjective Norms | -4.032 | 110.1 | .000 | -2.910 |
| Descriptive Norms | -2.180 | 110 | .016 | -0.657 |
| PBC | -2.236 | 92.3 | .014 | -1.374 |
| Intention | -2.924 | 110 | .002 | -1.625 |
| Indirect Past Behav. | -.056 | 110 | .478 | -.020 |

4.3 Considering Electricity as an External Variable

The comparisons previously described shows that MHP inconsistently influenced the concepts. Participants at the MHP village showed more positive control beliefs, descriptive norms, and PBC in Tanete-Lebani comparison. However, in Palakka-Pasang comparison, participant at the MHP village showed less concerns toward forest conservation. Tabel 3 confirms that participants at the MHP villages (Tanete and Palakka) did not show more concerns toward forest conservation than those at the non-MHP villages (Lebani and Pasang). Participants at non-MHP villages even showed more positive behavioral beliefs, attitudes, and intention toward forest conservation behavior than those at MHP villages.

Table 3. T-test results of the concepts between MHP and non-MHP participants

| Concepts | t | Df | Sig. (1-tailed) | Mean Difference |
|----------------------|--------|-----|-----------------|-----------------|
| Behavioral Beliefs | -2.124 | 226 | .017 | -0.398 |
| Normative Beliefs | -.434 | 227 | .332 | -0.058 |
| Control Beliefs | .765 | 224 | .223 | 0.134 |
| Attitude | -1.795 | 228 | .037 | -1.421 |
| Subjective Norms | -1.628 | 227 | .053 | -0.878 |
| Descriptive Norm | .421 | 226 | .337 | 0.088 |
| PBC | .388 | 228 | .349 | 0.174 |
| Intention | -2.015 | 226 | .023 | -0.837 |
| Indirect Past Behav. | -.198 | 226 | .422 | -0.048 |

Table 4. T-test results of the concepts between electricity and non-electricity participants

| Concepts | t | Df | Sig. (1-tailed) | Mean Difference |
|----------------------|-------|-----|-----------------|-----------------|
| Behavioral Beliefs | 2.686 | 226 | .004 | 0.500 |
| Normative Beliefs | 2.471 | 227 | .007 | 0.324 |
| Control Beliefs | 1.773 | 224 | .039 | 0.308 |
| Attitude | 3.058 | 228 | .001 | 2.390 |
| Subjective Norms | 3.797 | 227 | .000 | 1.998 |
| Descriptive Norm | 3.625 | 226 | .000 | 0.739 |
| PBC | 3.522 | 228 | .000 | 1.539 |
| Intention | 1.828 | 226 | .034 | 0.760 |
| Indirect Past Behav. | -.108 | 226 | .457 | -0.026 |

The participants were then regrouped into participants at the villages with electricity (Tanete and Pasang) and participants at the villages with no electricity (Lebani and Palakka^b). The t-test results in table 4 reveal that participants at the electrified villages were better in every concept except for the indirect past behavior.

^b Palakka was assumed as a non-electrified village due to the fact that they have only had electricity for a year which is not long enough to change beliefs, attitudes, and behavior. Comparing participants at Palakka with those at Lebani (no electricity), we found that attitudes were the only significant different between them. Participants at Lebani ($M_{Att} = 5.59, SE = 0.75$) significantly showed more favorable attitudes toward forest conservation than those at Palakka ($M_{Att} = 3.49, SE = 0.88$), $t_{Att}(115) = -1.810, p < .05$ (2-tailed).

4.4 Predicting Intention toward Forest Cutting

To find out which variables determined intention toward forest cutting, a hierarchical regression analysis in combination with a forced entry method was performed (see table 5). At step 1, attitudes, subjective norms, and PBC were entered. They were followed by descriptive norms, past behavior, MHP, and education. Dummy coding was created for education variable that was categorical. Other variables were excluded due to their insignificant correlations with intention.

Table 5. The regression analysis summary

| Step | Concepts | B | Std. Error B | Beta |
|---------------------------------|----------------------------------|----------------------|--------------|-------|
| Step 1 | Attitude | 0.000 ^{ns} | 0.009 | -.004 |
| | Subjective Norms | 0.043** | 0.012 | .274 |
| | PBC | 0.015 ^{ns} | 0.014 | .078 |
| Step 2 | Attitude | -0.005 ^{ns} | 0.009 | -.047 |
| | Subjective Norms | 0.035** | 0.013 | .220 |
| | PBC | 0.015 ^{ns} | 0.014 | .077 |
| | Descriptive Norm | 0.002 ^{ns} | 0.030 | .005 |
| | Have you ever cut trees? (1=yes) | -0.209* | 0.092 | -.160 |
| | has MHP installed? (1=yes) | 0.113 ^{ns} | 0.085 | .087 |
| | Illiterate vs Elementary School | 0.331 ^{ns} | 0.259 | .083 |
| | Junior HS vs Elementary School | -0.030 ^{ns} | 0.110 | -.018 |
| | Senior HS vs Elementary School | -0.048 ^{ns} | 0.109 | -.030 |
| University vs Elementary School | -0.458* | 0.201 | -.154 | |

Note: The dependent variable is square root intention; $R^2 = .095$ for Step 1, $p < .001$; $\Delta R^2 = .067$ for Step 2, $p < .05$; ^{ns} not significant; * $p < .05$; ** $p < .01$; *** $p < .001$.

Step 1 of table 5 shows that only subjective norms out of the TPB three predictors of intention explained significant variance in intention toward forest cutting. It explained about 10% of the variation. In step 2, past behavior and university-graduate variable explained some more variances in intention toward forest cutting. The extended TPB model accounted for 16% variance in intention.

5 DISCUSSION

The result of the study shows that MHP was not the variable that shaped concerns toward forest conservation more positively, but rural electrification was. However, how the electricity increased villager concerns toward forest conservation was not clear. Electricity perhaps increases villagers' exposure to more information related to forest conservation. Information may be delivered by the electronic media such as radio and television. The difference in information exposures creates a condition called *information gradient* indicating that the information exposures are concentrated in urban areas and are gradually de-concentrated as we move to more rural areas [15]. There should be more information available at the electrified villages than at the non-electrified villages. Moreover, the villages that savor rural electrification are usually geographically closer to urban areas increasing their chance to more information exposures. Information in turn may influence beliefs, attitudes, norms, perceived control, intention, and behavior. Ajzen suggested that informational factors (experience, knowledge, and media exposures), together with personal and social factors, can also act as external factors that shape beliefs, attitudes, norms, perceived control, intention, and behavior [5][16]. Rural electrification may allow for different experience, knowledge, and media exposure that positively influence beliefs, attitudes, norms, perceived control, intention, and behavior toward forest conservation. This idea is confirmed by the t-test results in table 4.

Step 1 of the regression analysis (Table 5) shows that subjective norms was the only variable that predicted intention. Attitudes and PBC could not explain any significant variances in intention.

It differs from general finding in which attitudes were usually the dominant one and subjective norms were the weakest [17][7][5]. However, the study of Trumbo and O'Keefe, which assesses intention to conserve water in three distinct communities in the California-Nevada Truckee River Watershed, supports our finding [15]. Their study found that subjective norms explained more variance in intention to conserve water than attitudes and PBC did. Other studies suggested that subjective norms could be associated with collectivistic culture in which strong social attachments increased people's willingness to behave accordingly with others' expectations and that the collectivistic culture comprised mostly people that were normatively controlled [18][19]. Therefore, perhaps the collectivistic culture was the reason for the dominance of subjective norms in determining intention.

The second predictor of intention was past behavior (*Have you ever engaged in forest cutting or asked/hired others to do it?*). Many studies supported the finding that past behavior explained unique variance in intention [11][13][14]. Connor and Armitage even suggested that past behavior should be added in future research [14]. However, Ajzen proved that the residual effect of past behavior on intention and later behavior could occur when the principle of compatibility was violated, when attitudes and intention were unstable, when PBC and beliefs were inaccurate and unrealistic, and when the planning for the execution of intention was insufficient [20]. In the present study, unstable attitudes and inaccurate PBC might be the main reason for the significant residual effect of past behavior on intention. Unfortunately, the present study could not test them. The insignificant effects of attitudes and PBC in intention might be an indication of unstable attitudes and inaccurate PBC.

Gender and education are two demographic variables that usually influence attitudes and behaviors toward forest conservation [21]. Gender was not taken into account since only male participants responded to the questionnaire. Literate farmers usually provided more support to forest conservation programs [22]. It gave support to our finding that the education variable influences intention toward forest cutting. The results found that university graduates showed less intention toward forest cutting.

The fact that the TPB model explained only 10% variance in intention left 90% of the variation in intention unexplained. Even if we extended the model, it only predicted 16 % of the variation. For a comparison, two meta-analyses study found that the average variation in intention explained by TPB model was 42% and 50% [11][23]. The reason is possibly related to the disguised technique that was applied. The technique, for example, asked the perception of others' intention toward forest cutting instead of the participant's own intention. Perhaps, the perception of others' intention could not fully reflect the participant's own intention. It could be the explanation of why past behavior still had some residual effect on intention. Moreover, it is probable that the perception of others' intention will strongly correlate with the perception of others' expectation (as a simple definition of the subjective norms). It might explain why the subjective norms became the dominant predictor of intention.

6 CONCLUSION

Based on the results and the discussion above, it is concluded that MHP is not the particular variable that shapes beliefs, attitudes, norms, intention, and behavior toward forest conservation but electricity is. It implies that rural electrification, regardless of its sources, may reduce deforestation caused by villagers and small farmers. The government should boost rural electrification programs as they provide some additional benefits such as reducing deforestation and increasing pro-environmental concerns.

The second conclusion is that intention toward forest cutting is determined by subjective norms, past behavior and education. It means that information emphasizing social norms can be created in order to reduce deforestation. Direct counseling, education, or advertisement intended to increase social pressures may activate the collectivistic self to act in accordance with pro-environmental norms. Increasing the level of education may also help. However, most of the

respondents reported that their income was less than USD 50, which is below the USD 2/day poverty line. As poverty is usually correlated with low level of education, comprehensive programs intended to reduce poverty and to increase education may reduce deforestation by small farmers. This second conclusion, however, is limited by the fact that the model only explained 16% variance in intention toward forest cutting

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