



Original Research Paper

KNOWLEDGE, IMPLEMENTATION, AND COMPLIANCE WITH FORESTRY LAWS AMONG FOREST-DEPENDENT COMMUNITIES: TOWARDS SUSTAINABLE FOREST MANAGEMENT

Jomel B. Pinera

Cagayan State University-Gonzaga Campus, Flourishing, Gonzaga, Cagayan, 3513 Philippines

jomel.pinera@csu.edu.ph

ORCID ID: 0000-0002-6083-0669

ABSTRACT

Forests are among the valuable natural resources of the Philippines due to their environmental, social and economic significance. Sadly, these resources gradually disappearing due to continued deforestation. This study determines the level of knowledge, compliance and implementation of the forestry laws among the forest-dependent communities in Cagayan. Determine whether there's a significant relationship between knowledge level and profile, the compliance level and profile, and determine whether compliance level is related to the level of knowledge and whether compliance level is related to the level of implementation of the forestry laws among the respondent's forest-dependent communities. The study used a descriptive and correlation research design. Findings yielded that the respondents are knowledgeable and submissive with the forestry laws and it is implemented in an acceptable level. The age, income, occupation is positively related with the level of knowledge. Educational attainment and income are positively associated with the level of compliance. Moreover, there's a high positive correlation between the respondent's knowledge and compliance as well as between compliance and implementation. From the results, it is suggested that a constant education drive to the forest-dependent communities about forestry laws and an aggressive enforcement campaign with emphasis on illegal cutting and unlawful occupation be conducted. The provision of alternative livelihood catering low-income families to reduce dependence on forest resources is encouraged. Enforcement capability be strengthened through the use of technology like remote sensing for monitoring and enlisting the help of the residents to reinforce enforcers in the enforcement of the forestry laws is encouraged.

Keywords: Knowledge, Compliance, Implementation, forestry laws, forest-dependent communities

INTRODUCTION

Forests are crucial habitats for biodiversity and they are also essential for the provision of a wide range of ecosystem services that are important to human well-being (Brockerhoff et al., 2017). In the Philippines, forest is among the most valuable natural resources providing immense environmental, social, cultural, and economic benefits. They play a serious role in nourishing biodiversity, regulating the weather, and support the livelihoods of forest-dependent communities. Sadly, these fundamental assets are gradually disappearing because of continued, deforestation, illegal logging, and unsustainable land-use practices (Agub et al., 2018). About 97% of the Philippines' tropical forest have been exposed to logging activities, and are often transformed to other land uses such as for farming (Pang, et al., 2021) In rural zones, environmental problems of critical concern include loss of watershed integrity and destruction of the agricultural lands as a result of improper and unjustifiable land use and agricultural practices in upland areas, and massive deforestation (ADB Report, 2016).

In the aftermath of extensive flooding caused by Typhoon Ulysses in the Cagayan Valley Region, the Department of the Interior and Local Government (DILG) has ordered local government units (LGUs) and the Philippine National Police (PNP) to enforce a crackdown on illicit logging, unlawful quarrying and kaingin/slash and burn practices and to accelerate the planting of trees in coordination with the Department of the Environment and Natural Resources (DENR). DILG Secretary Eduardo M. Año said all LGUs and PNP units in the country must prioritize the defence of the environment.

In Gonzaga town, the local police recorded at least 102 forestry laws violations from year 2017 to 2020. Seventy-nine (79) of which is a violation of PD 705 or the Revised Forestry Code of the Philippines while twenty-three (23) cases are violations of RA 9175 otherwise known as the "Chainsaw Act of 2002". Numerous individuals were arrested by police due to engagement in illegal logging, slash and burn practices commonly known as "kaingin" of all which were perpetrated through the use of "chainsaw".

This study explores the current state of forest resource protection and management in the study setting by determining profile of the respondent's forest-

***Corresponding Author:**

Received: 25th May, 2026; Revised: 6th June, 2026; Accepted: 8th June, 2026; Available Online: 29rd July, 2026

(DOI): 10.70102/AEJ.2026.18.2s.16

dependent communities in terms of sex, age, civil status, educational attainment, monthly income, ethnic affiliation, number of child and livelihood; determine the level of knowledge, implementation and compliance with forestry laws as perceived by the three (3) groups of respondents; determine whether profile variable has significant relationship with the level of knowledge and compliance with forestry laws; whether there is a significant relationship between level of knowledge and level of compliance with forestry laws; and determine whether there is a significant relationship between level of compliance and level of implementation with forestry laws. By understanding these, this research seeks to underwrite to the development of sustainable management strategies that ensure the long-term preservation of these vital ecosystems for future generations.

MATERIALS AND METHODS

Methods of Research

This study used the descriptive research since it measures the perception of the respondents with the level of knowledge, level of compliance and level of implementation with the forestry laws. Moreover, the study used the correlation method since it determines the relationship between level of compliance and level of implementation with the forestry laws as perceived by the three (3) groups of respondents. Likewise, correlation was used in determining the significant difference between level of knowledge and level of compliance with forestry laws. Moreover, the profiles of the respondent's forest-dependent communities were also correlated with their level of knowledge and compliance with the forestry laws.

Respondents of the Study

There were three (3) groups of respondents in this study. The first group includes the Police Officers and the officers from the Local Department Environment and Natural Resources (DENR) in Gonzaga responsible in the enforcement of the forestry laws (40); the Barangay officials who are task to help the local police and in ensuring that environments are protected by their constituents (30); and the forest-dependent communities in the identified forest dependent barangays in Gonzaga namely Barangay Cabiraoan, Sta. Maria, Isca, Magrafil, and Sta. Clara (148).

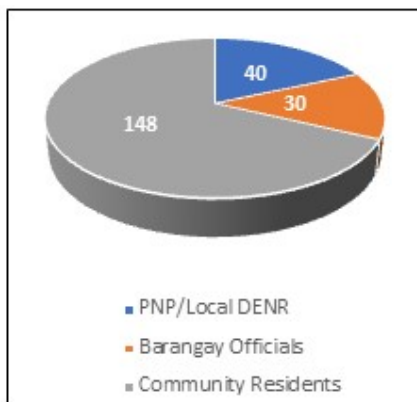


Figure 1 Distribution of Respondents
Locale of the Study

The study was conducted at Gonzaga, Cagayan. Cagayan is a province of the Philippines in the Cagayan Valley Region. It is located at the Northeastern corner of the island of Luzon. It is bounded by Ilocos Norte and Apayao to the West, while Kalinga and Isabela to the South. The municipality of Gonzaga which serves as the locale of the study is situated at the North-eastern tip of the province, bordered by the municipality of Santa Ana to the north-east, the municipality of Santa Teresita to the west, and the municipality of Lal-lo to the south while the South-eastern part of the Municipality is the Sierra Madre-the Philippine's longest mountain range. It is roughly 45 kilometres from Aparri, the nearest commercial center, 125 kilometres from the provincial capital of Tuguegarao City, and 607 kilometres from Manila.

The municipality has two proclaimed watersheds, the Baua River watershed and Wangag River watershed, through Presidential Proclamation Nos. 107 & 108 respectively on May 13, 1987. Further, Baua Watershed has a total area of 8,955 hectares located at Barangays Cabiraoan, Magrafil, Sta. Maria and San. Jose. The Wangag watershed reserve covers an over-all land area of 6,992 hectares within Barangays Isca, Pateng, Sta. Clara and Tapel.



Figure 2 Shows the Municipality of the Study Setting

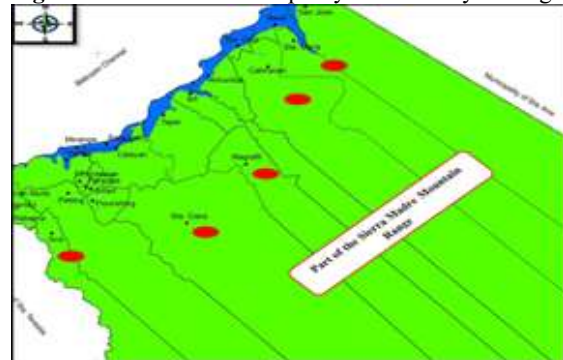


Figure 3 Forest-Dependent Communities

Research Instrument

The data were taken from the respondents through a survey questionnaire developed based from Presidential Decree 705 otherwise known as the "Revised Forestry Code of the Philippines" and Republic Act No. 9175 otherwise known as the "Chain Saw Act of 2002". It composed of two (2) parts. First part determined the level of knowledge and compliance with the provision of the laws and the second part determined the level of implementation with the laws

as perceived by the respondents. The questionnaires were translated to local dialect for easy understanding of the respondents. The particular dimensions assessed from the provision of PD 705 includes the following: Cutting, gathering timber or other forest products; Unlawful occupation or destruction of forest lands; Pasturing livestock and the prohibited acts of RA 9175 or the Chainsaw Act.

The data were collected upon approval by the Campus Executive Officer of the Cagayan State University to conduct the study. Prior consent of the respondents was asked also namely the police officers from Gonzaga Police Station including its Chief of Police, the Municipal Mayor of Gonzaga on the part of the Local DENR from the Local Government Unit, and the Barangay Officials including the community residents.

Data Analyses

Numerical Values	Mean Range	Verbal Interpretation
4	3.26-4.00	Very Much Complied/ Very Much Implemented/ Very Much Knowledgeable
3	2.51-3.25	Much Complied/ Much Implemented/ Much Knowledgeable
2	1.76-2.50	Moderately Complied/ Moderately Implemented/ Moderately Knowledgeable
1	1.00-1.75	Not Complied/ Not Implemented/ Not Knowledgeable

Respondent's responses on the level of knowledge, compliance, and implementation with the forest laws was measured through a four-point Likert scale:

T-test was used in determining the differences in knowledge and compliance levels between male and female respondents, the relationship between sex and compliance level. Analysis of Variance was used in assessing the knowledge level among occupational groups and the knowledge level among ethnic groups, the compliance level among different occupation groups and the compliance level among ethnic groups. While Pearson rho was used in determining the compliance level in relation to the respondent's forest-dependent communities in terms of age, educational attainment, monthly income and number of children. Likewise in assessing the relationships between knowledge level and compliance level and the relationships between level of compliance and level of implementation of forestry laws.

RESULTS & DISCUSSION

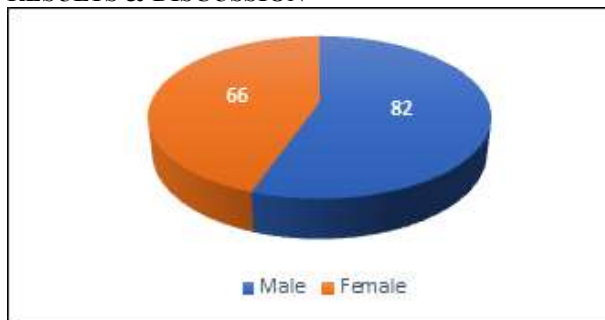


Figure 4 Profile of the Respondent's Forest-Dependent Communities in Terms of Sex (n=148)

Among the residents involved in the study, there are more male than the female respondents, with the males comprising the majority (82 or 55.41%) while the females are 66 comprising 44.59%.

The predominance of male respondents in the study setting implies that men are more involved in forestry-related activities. This can be reflective of traditional gender roles where men are more engaged in physical and outdoor work such as logging, timber production, and other forestry operations. This also indicates that men are the primary decision-makers in forestry-related matters within their households or communities.

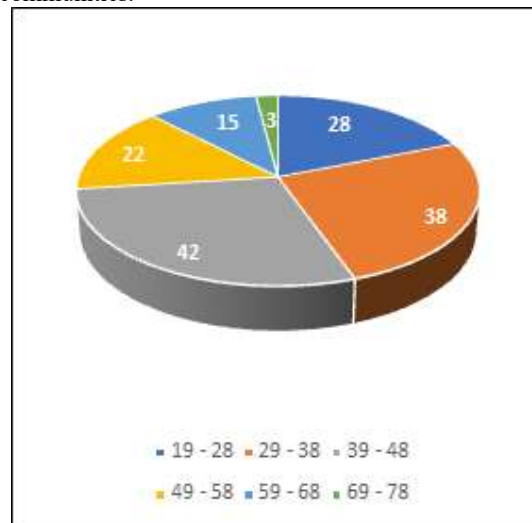


Figure 5 Profile of the Respondent's Forest-Dependent Communities in Terms of Age (n=148)

Most of the respondents are in their Middle Ages of 39 to 48 years old (42 or 28.38%) followed by ages of 29-38 accounted to 38 or 25.68% while the least of them (3 or 2.03%) are the oldest among the respondents in 69 to 78 years old. The mean age is 41.05 years.

This suggests that most of the respondents (middle-aged) have accumulated more significant experience in their personal lives. In the context of forestry, they are likely to have substantial hands-on experience and knowledge about forestry practices, laws, and regulations which is vital in the study. The data also suggest that there are still old individuals engaged in forest farming in the study setting.

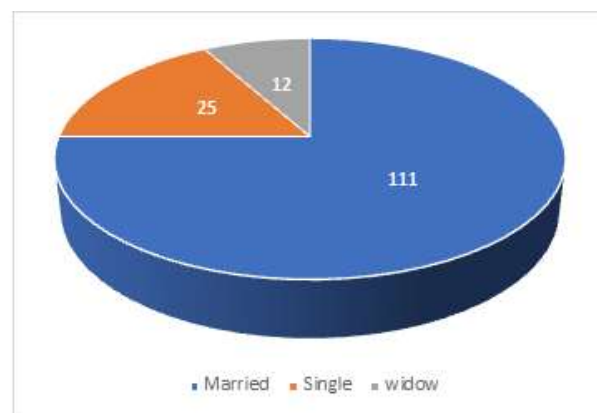
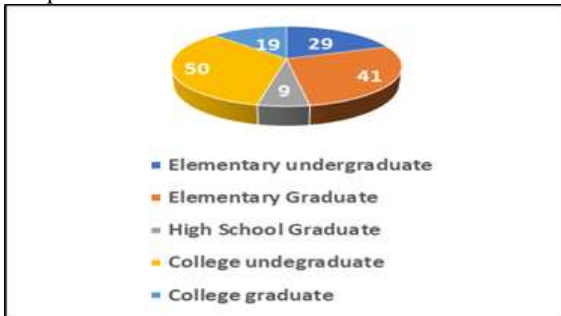


Figure 6 Profile Respondent's Forest-Dependent Communities in Terms of Civil Status (n=148)

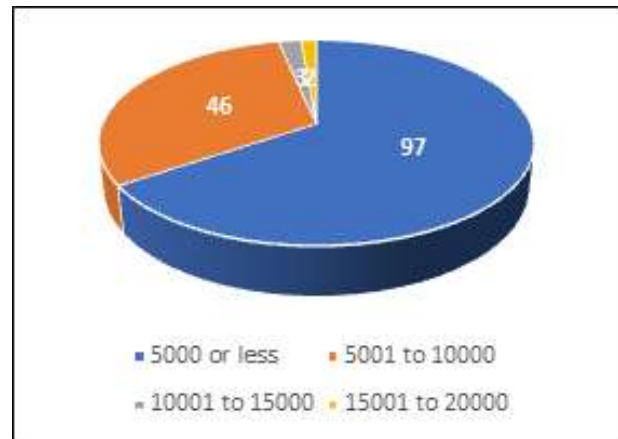
Majority of the resident-respondents are married (111 or 75.00%), followed by those who are single (25 or 16.89%), while the least are those who are widows with 12 or 8.11%.

This suggest that there more married individuals in the study setting hence, can positively influence their ability to comply with forestry laws. They are more concerned about the long-term welfare of their families than their counterparts. This concern can drive them to comply with forestry laws to ensure a sustainable environment for their children and future generations. The high proportion of married respondents suggests that they bring stability, responsibility, and strong community connections to the context of forestry law compliance.

**Figure 7** Profile Respondent's Forest-Dependent Communities in Terms of Educational Attainment (n=148)

On the educational attainment of the resident-respondents, most of them have gone to college but did not finish it (50 or 33.78%), followed by those who finished elementary only (41 or 27.70%), those who have not finished elementary (29 or 19.59%) those who are college graduates (19 or 12.84%), while the least are the high school graduates (9 or 6.08%).

This implies that majority of the respondents possess a basic level of education, which includes some understanding of laws and regulations. However, their knowledge might be limited to theoretical aspects rather than practical application. This group is likely to have developed critical thinking skills that allow them to know the significance of forestry laws and analyze the consequences of non-compliance. Moreover, they open to learning and new information. They are in an educational environment that encourages the acquisition of new knowledge, including environmental and legal issues.

**Figure 8** Profile Respondent's Forest-Dependent Communities in Terms of Monthly Income (n=148)

Majority (97 or 65.54%) of the resident-respondents earn a monthly income of PhP 5,000 or less, followed by those who earn PhP 5,001 to PhP 10,000 (46 or 31.08%), those who earn PhP10,001 to PhP15,000 (3 or 2.03%), while there are only 2 respondents or 1.35% who earn PhP15,001 to PhP20,000 monthly. The respondents earn a mean income PhP 5,136.83 monthly.

The data reveal that most of the respondents have a difficult living condition considering the relatively low mean monthly income. With a low income, respondents likely to prioritize their basic needs like food and shelter over compliance with the forestry laws. With low income, the respondents depend directly on forestry resources for their livelihoods which lead to conflicts between short-term economic needs and long-term environmental sustainability. Hence, illegal logging or slash-and-burn agriculture may be seen as necessary for immediate survival despite being against forestry laws. The financial struggle might limit their ability to participate in conservation activities or invest in sustainable practices. This finding is supported by Ramcilovic-Suominen et al (2013) where 44% of his respondents reported dis-obedience with forestry rules in Ghana due to monetary gain besides from lack of sanctions among others. While low compliance level to forestry rules is attributed to enormous financial incentives for non-compliance for the farm workers and timber operators, and in the latter case both with and without legal permits in Ghana (Hansen 2011).

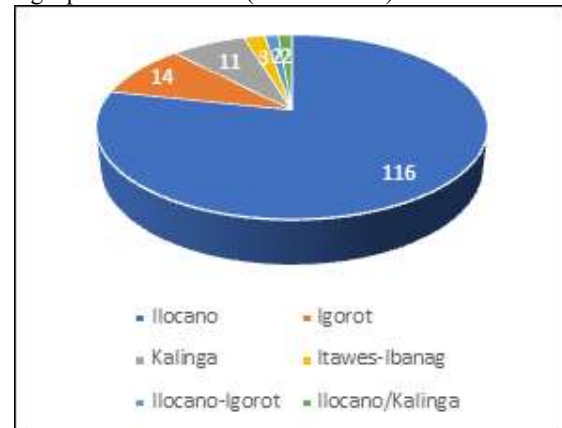
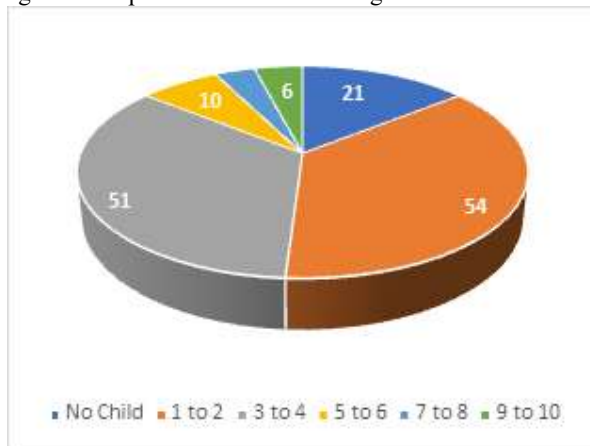


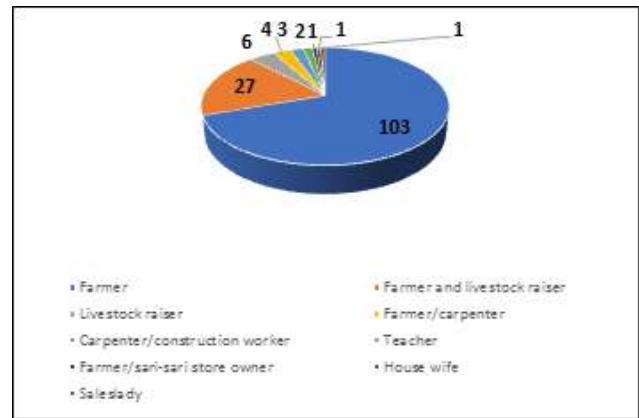
Figure 9 Profile Respondent's Forest-Dependent Communities in Terms of Ethnic Group (n=148)

More than three-fourth of the respondents are Ilocanos (116 or 78.38%), followed by Igorots (14 or 9.46%), and Kalingas (11 or 7.43%) while the rest are hybrids or mixed-blood of Itawes-Ibanag (3 or 3.03%), Ilocano-Igorot (2 or 1.35%), and Ilocano-Kalinga (2 or 1.35%).

This suggests that most of the respondents in the study setting were Ilocanos. Historically they migrated to the Eastern part of Cagayan from the Ilocos Region. Ilocanos have a long history of rice farming and places a high value on hard work and self-reliance and these values drive their involvement in various agricultural and forest-based activities as part of their livelihood and sustenance. On the other hand, Igorots also in the study setting plant a diversity of crops including vegetables, root crops. Their farming practices are well-adapted to the mountainous terrain in the place. Their expertise in rice cultivation, especially in terraced fields, reflects a deep understanding of agricultural practices and land management.

**Figure 10** Profile Respondent's Forest-Dependent Communities in Terms of Number of Children (n=148)

Most of them (54 or 36.49%) have 1 to 2 children, followed by those who have 3 to 4 children (51 or 34.46%), those with no child (21 or 14.19%), those with 5 to 6 children (10 or 6.76%), while the rest have 9 to 10 children (6 or 4.05%), 7 to 8 children (5 or 3.38%) and 1 respondent has 11 to 12 children (0.68%). This implies that most of the respondents have a fewer number of children. This means that they experience less economic pressures compared to those with more children 3-4 and higher. Their lower numbers of dependents could mean fewer financial constraints potentially allowing these families to allocate resources more readily towards compliance with forestry laws, such as purchasing permits or investing in sustainable practices. However, those respondents with more children may face greater financial strain, which could impact their ability to comply with forestry laws. This financial strain led them to prioritize immediate needs over legal compliance especially that they rely also on forest resources for subsistence.

**Figure 11** Profile Respondent's Forest-Dependent Communities in Terms of Livelihood (n=148)

Majority (103 or 69.59%) are farmers, followed by those who are both farmers and livestock raisers (27 or 18.24%), those who are purely livestock raisers (6 or 4.05%), farmer-carpenters (4 or 2.70%), carpenters; construction workers (3 or 2.03%), teachers (2 or 1.35%) while one each was a farmer; sari-sari store owner, housewife and saleslady.

This suggests that farmers usually those engaged in rice/corn farming are the most respondents and residents in the study area. This further implies that they also resort to upland rice/corn and vegetable planting making them susceptible to expand their tilling area through slash and burn practices. Moreover, some respondents also are engaged not only in farming but also livestock rising which extends from backyard hog raising up to cattle raising and this drives them to used and or expand their grazing lands/pasture lands through occupation of forest areas needed for needs. The increased population drive them to expand their planting areas in order to meet growing food requirement and this lead to intrusion into forestry reserve (Ahmed et al. 2017). Likewise, incursion of forest lands by rural families, communities or private corporations to convert them to agriculture or cattle ranching is one among the environmental violations which requires devising and implementing operational systems to strengthen in order to detect and suppress such unlawful acts (Contreras-Hermosilla, 2022).

Table 1 Level of Knowledge Forestry Laws among the Respondent's Forest-Dependent Communities as perceived by the Three. Groups of Respondents (n=218)

Respondents/ Area of Assessment	PNP and Local DENR		Communi ty Residents		Barangay Officials	
	Mea n	DI	Mea n	DI	Mea n	DI
a) Cutting, gathering/collecting timber or other forest products w/out license	3.34	VMK	3.07	MK	2.89	MK
b) Unlawful occupation or destruction	3.25	MK	3.04	MK	2.87	MK

of forest lands						
c) Pasturing livestock	3.13	MK	3.04	MK	2.67	MK
d) Chainsaw Law or Act	3.27	VMK	3.03	MK	2.78	MK
Weighted Mean	3.10	MK	2.95	MK	2.74	MK

Legend: 3.26-4.00 Very Much Knowledgeable (VMK)

2.51-3.25 Much Knowledgeable (MK)

(MK)

1.76-2.50 Moderately Knowledgeable (MDK)

1.00-1.75 Not Knowledgeable (NK)

There were three groups of respondents who gave their assessments on the level of knowledge of the residents about the environmental laws: the first group are the Police and the Local DENR; second group consisted of the Forest-Dependent Communities, and the third group consists of barangay officials. On the part of Police and Local DENR personnel as respondents, on the four areas of the environmental law, they perceived that the respondent's forest-dependent are Very Much Knowledgeable about the provisions on Cutting or collecting timber or other forest products without license and on the provisions on Chainsaw Law or Act, while they are Much Knowledgeable about the provisions on Unlawful occupation or destruction of forest lands and on Pasturing livestock. The respondent's forest-dependent communities on the other hand have knowledge level of Much Knowledgeable in all the four areas of the environmental laws as supported by a weighted mean 2.95. The respondents who are officials in the barangays included in the study perceived that the residents have knowledge level of Much Knowledgeable in all the four areas of the environmental laws as supported by a weighted mean of 2.74. This suggests that the respondent's forest-dependent communities have a high level of knowledge about forestry laws. They know that cutting or gathering timber or other forest products without license is a violation as well as the occupying forest land without authority. Moreover, they are knowledgeable that it is prohibited for any person to graze or cause to graze livestock in forest lands without authority under a lease or permit as well as that only licensed wood processor and person/applicant who shall use the chain saw for legal purpose are the only authorized to be issued with permits to possess and/or use a chain saw. This further suggest that they are well-informed about legal requirements, regulations, and the importance of conservation of forest resources and this knowledge can lead to better decision-making regarding land and resource use, potentially resulting in higher levels of compliance. With the increased awareness, residents are less likely to engage in activities that violate forestry laws, as they understand the legal consequences and the benefits of adhering to regulations. This can lead to a reduction in illegal activities such as unauthorized logging, kaingin (slash and burn) and unlawful occupation among others. This finding runs the same with the findings of Amankwa et al (2024) that advancing obedience with forest laws

necessitates education and awareness creation. That there's a need for a communal education and awareness initiatives on forest laws by forest management agencies to benefit from the positive effect of social norms and education on forest law compliance. Similarly, acquaintance, information and harmonization are identified as the most important bottlenecks in the enhancing the implementation of regulation on habitat conservation (Simila et al., 2014).

Table 2 Level of Compliance with Forestry Laws among the Respondent's Forest-Dependent Communities as Perceived by the Three Groups of Respondents

Respondents/ Area of Assessment	PNP and Local DENR		Communit y Residents		Barangay Officials	
	Mea n	DI	Mea n	DI	Mea n	DI
a) Cutting, gathering/collecting timber or other forest products /out license	3.14	MC	3.11	MC	2.73	MC
b) Unlawful occupation or destruction of forest lands	3.12	MC	2.99	MC	2.54	MC
c) Pasturing livestock	3.11	MC	2.77	MC	2.51	MC
d) Chainsaw Law or Act	3.07	MC	2.91	MC	2.55	MC
Weighted Mean	3.22	MC	3.01	MC	2.71	MC

Legend: 3.26-4.00 Very Much Complied (VMC)
2.51-3.25 Much Complied (MC)

1.76-2.50 Moderately Complied (MDC)

1.00-1.75 Not Complied (NC)

In terms of compliance with forestry laws, the results of the study (Table 2) revealed that the three groups of respondents perceived that the respondent's forest-dependent communities have a compliance level of Much Complied in all the four areas of the environmental laws. The PNP and Local DENR personnel perceived that the residents have a mean compliance rating of 3.22 (Much Complied), the barangay residents had a mean compliance rating of 3.01 (Much Complied), while the barangay officials perceived that the residents have a mean compliance rating of 2.71 (Much Complied).

The findings suggest that they generally respect and are willing to follow forestry laws. They understand the importance of these regulations and make significant efforts to adhere to them. This further manifest that the community has access to educational programs and outreach efforts that inform them about the importance and specifics of forestry laws, leading to a high degree of compliance. Obedience with forest laws is due to a myriad of factors, including the need of the forest products to support livelihoods (Ramcilovic-Suominen, 2013).

The findings however, suggest there is a considerable degree of compliance but not to the fullest extent possible. This shows that there still barriers exist that

leads to non-fully compliance like economic pressures, knowledge gaps, and enforcement challenges. The findings are the same with the situation in Cameroon's forestry where its forest sector is plagued by illegal acts, the primary reason that facilitate illegal actions in the forest sector are not comprehensive legal system, inadequate knowledge and poor knowledge management (Amariei 2005). Moreover, In Ghana, when community members do break the rules, others approved it and this will lead to their non-compliance also (Ramcilovic-Suominen, 2013).

Table 3 T-test Analysis of Differences in Knowledge and Compliance Levels between Male and Female Respondent's Forest-Dependent Communities

VARIABLES	T PROB	Decision and Conclusi on
Sex (Male and Female) and Knowledge Level	0.894	No difference in knowledge level between male and female; no relationship between sex and knowledge level
Sex (Male and Female) and Compliance Level	0.943	No difference in compliance level between male and female; no relationship between sex and compliance level

In terms of the relationship between sex and knowledge level, the t-test of difference revealed that there is no significant difference on the level of knowledge about forestry laws between male and female respondents (Table 3). The t-test of difference yielded a probability of 0.894 which is numerically higher than 0.05, therefore the null hypothesis cannot be rejected, but is accepted.

This result means that the male and female respondents are just equal in their knowledge levels about forestry laws. It means further that sex has nothing to do with the respondents' level of knowledge about forestry laws.

Table 4 Pearson rho Analysis of Relationships between Knowledge Level and Other Profile Variables

Knowledge Level and Profile	R h o	t- com pute d	t tab ula r at	Dec isio n	Con clusi on
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			.05		
1. Age and Knowledge Level	0.135	2.072	1.960	Rej ect Ho	Positiv ely related
2. Educational Attainment and Knowledge Level	0.102	1.521	1.960	Acc ept Ho	No relatio nship
3. Monthly Income and Knowledge Level	0.151	2.251	1.960	Rej ect Ho	Positiv ely related
4. Number of Children and Knowledge Level	0.084	1.239	1.960	Acc ept Ho	No relatio nship

On the association between the respondent's forest-dependent communities' profile and their knowledge level about environmental laws (Table 4), the Pearson rho analysis yielded a positive correlation of $r = 0.135$ between knowledge level and age, and $r = 0.151$ between knowledge level and monthly income. In these two variables, the t test of significance yielded computed t values that are higher than the tabular values, with $t_c = 2.072$ for age and $t_c = 2.251$ for monthly income, both of which are higher than the tabular value of 1.960. Therefore, the null hypotheses for these two variables are rejected and the alternative hypotheses are the basis of conclusion.

The result means that the knowledge levels of the resident-respondents are positively associated with their age and monthly income. It means further that the older, the more knowledgeable and the higher the income, the more knowledgeable. This further implies that older respondents tend to have a higher level of knowledge about forestry laws and this is due to accumulated life experiences, longer exposure to information and education, or a greater likelihood of having encountered or been involved in activities related to forestry laws over time. While respondents with higher monthly income are more knowledgeable about forestry laws than their counterpart. This suggest that respondents with more financial resources have better access to education and information, including awareness programs, training, or media that disseminate knowledge about forestry laws. In Ghana, those high-income community residents are significantly aware of the regulations Sobeng et al. (2023).

On the other hand, the Pearson rho analysis showed no relationship between level of knowledge and educational attainment and number of children of the resident-respondents. In other words, whether the respondent has attained high or low education, it has nothing to do with whether he or she is knowledgeable or not about forestry laws. Whether he or she has many or few children, it has nothing to do with whether he or she is knowledgeable or not about forestry laws. This finding runs counter with the finding of Dolkar et al., (2013) that the level of awareness on environmental issues correlates positively with level of education of farmers' awareness regarding the negative effects of using Green Revolution technology.

Table 5 Analysis of Variance in Knowledge Level among Occupational Groups

ANOVA Table

Source of Variance	Df	Sum of Squares	Mean Square	Fc
Between groups	2	2.99	1.495	-3.820
Within groups	215	-84.08	-0.391	
Total	217	-81.09		

$F \alpha, (p-1, n-p) = F \alpha, (2, 215)$

Since $F_c = -3.820$ is greater than $F .05, (2, 215) = 3.32$, reject H_0 .

In terms of the knowledge level of the respondent's forest-dependent communities from different occupational groups (Table 5), the one-way Analysis of Variance yielded an F computed value of -3.820 which is numerically higher than the tabular value of 3.32 at 0.05 level of significance. Therefore, the null hypothesis that knowledge level do not differ among the occupational groups is rejected, and the alternative hypothesis is accepted as basis for conclusion. This result means that the respondents with different occupations also differ in knowledge level about forestry laws. In other words, the occupation or livelihood of the respondent's forest-dependent communities has something to do with whether he is knowledgeable or not about forestry laws. This further implies that different occupations provide varying levels of exposure and relevance to forestry laws. Respondents engaged in agroforestry farming are likely to have more direct interaction with and knowledge of the laws compared to those in unrelated fields like those in purely lowland farming/carpentry and retail.

Table 6 Analysis of Variance in Knowledge Level among Ethnic Groups

Anova Table				
Source of Variance	df	Sum of Squares	Mean Square	Fc
Between groups	2	0.84	0.420	1.492
Within groups	215	60.53	0.282	
Total	217	61.37		

$F \alpha, (p-1, n-p) = F \alpha, (2, 215)$ Since $F_c = 1.492$ is less than $F .05, (2, 215) = 3.32$, accept H_0

It was found out that respondent's forest-dependent communities with different ethnic origin do not differ in their knowledge level about forestry laws (Table 6). The one-way Analysis of Variance yielded an F computed value of 1.492 which is numerically lower than the F tabular value of 3.32 at 0.05 level of significance. Thus, the null hypothesis that the level of knowledge does not differ among the ethnic origins cannot be rejected, but is accepted as basis for conclusion. This result means that the respondents from different ethnic origins do not differ in knowledge level about environmental laws. In other words, the ethnic origin whether Ilocano, Kalinga, Igorot or Ibanag has nothing to do with whether he or she is knowledgeable or not about forestry laws.

Table 7 T-test Analysis of Differences in Compliance Levels between Male and Female Respondent's Forest-Dependent Communities

Variables	T PROB	Decision and Conclusion
Sex (Male and	0.943	No difference in compliance

Female) and Compliance Level		level between male and female; no relationship between sex and compliance level
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On the relationship between sex and compliance level, the t-test of difference revealed that the level of compliance with environmental laws did not differ significantly between male and female respondents (Table 7). The t-test of difference yielded a probability of 0.943 which is numerically higher than 0.05, hence the null hypothesis cannot be rejected, but is accepted as basis for conclusion. This result means that the male and female respondents have the same levels of compliance with environmental laws. It means further that sex has nothing to do with the respondents' level of compliance with environmental laws.

Table 8 Pearson rho Analysis of Relationships between Compliance Level and Profile Variables

Compliance Level and Profile	rho	t-computed	t tabular at .05	Decision	Conclusion
1. Age and Compliance Level	0.119	1.755	1.960	Accept H_0	No relationship
2. Educational Attainment and Compliance Level	0.158	2.355	1.960	Reject H_0	Positively related
3. Monthly Income and Compliance Level	0.138	2.057	1.960	Reject H_0	Positively related
4. Number of Children and Compliance Level	0.072	1.062	1.960	Accept H_0	No relationship

On the association between the residents' other profile variables and their compliance with environmental laws (Table 8), the Pearson rho analysis yielded a positive correlation of $r = 0.158$ between compliance level and educational attainment, and $r = 0.138$ between compliance level and monthly income. In these two variables, the t test of significance yielded computed t values that are higher than the tabular values, with $t_c = 2.355$ for educational attainment and $t_c = 2.057$ for monthly income, both of which are higher than the tabular value of 1.960. Therefore, the null hypotheses for these two variables are rejected and the alternative hypotheses are accepted as the basis for conclusion. The result means that the compliance levels of the resident-respondents are positively associated with their educational attainment and monthly income. It means further that the higher is the educational attainment, the higher is the compliance level and the higher the income, the higher is the compliance level. This implies that respondents with higher educational attainment have a better awareness and understanding on forestry laws and regulations. They are more informed about the importance of forestry laws and the consequences of non-compliance, leading to higher compliance levels. Respondents with higher monthly income and resources also tend to be more compliant with the forestry laws than their counterparts since they have the financial means to use alternative resources instead of exploiting forestry resources illegally. In West Bengal State, India poor

socio-economic conditions of the households, and weak enforcement is seen as the chief reason to the deforestation and forest destruction (Basu et al., 2023). While a landless farmer in developing countries following logging operations or infrastructure works that increase accessibility of remote forest areas usually invade forestlands illegally (Mahar et al., 1994). However, not all households usually diversify its livelihood strategy such that not all of its activities are farm-based and forest-based (Balatico, 2018). Moreover, the most significant improvements in biodiversity defense and air purification in the Tano-Offin forest reserve in Ghana is environmental awareness concern and this is related to factors such as farmers' educational level and average annual family incomes among others (Appiah et. al., 2022).

On the other hand, the Pearson rho analysis showed no relationship between compliance level and age and number of children of the resident-respondents. In other words, whether the respondent is young or old, it has nothing to do with whether he or she is compliant or not with the environmental laws. Whether he or she has many or few children, it has nothing to do with whether he or she is compliant or not about environmental law.

Table 9 Analysis of Variance in Compliance Level among Different Occupation Groups

ANOVA Table				
Source of Variance	df	Sum of Squares	Mean Square	Fc
Between groups	2	1.85	0.925	-2.020
Within groups	215	-98.49	-0.458	
Total	217	-96.64		

$F \alpha, (p-1, n-p) = F \alpha, (2, 215)$

Since $F_c = -2.02$ is less than $F_{.05}, (2, 215) = 3.32$, accept H_o .

In terms of the compliance level of the respondents from different occupational groups (Table 9), the one-way Analysis of Variance yielded an F computed value of 2.020 which is numerically lower than the F tabular value of 3.32 at 0.05 level of significance. Hence, the null hypothesis that compliance level do not differ among the occupational groups cannot be rejected but is accepted as basis for conclusion. This result means that the respondents with different occupations do not differ in their compliance level with environmental laws. In other words, the occupation or livelihood of the respondent has nothing to do with whether he is compliant or not about environmental laws.

Table 10 Analysis of Variance in Compliance Level among Ethnic Groups

ANOVA Table				
Source of Variance	df	Sum of Squares	Mean Square	Fc
Between groups	2	0.4	0.200	0.72
Within groups	215	59.78	0.278	
Total	217	60.18		

$F \alpha, (p-1, n-p) = F \alpha, (2, 215)$

Since $F_c = 0.72$ is less than $F_{.05}, (2, 215) = 3.32$, accept H_o .

It was found out that respondents with different ethnic origin do not differ in their level of compliance with

environmental laws (Table 10). The one-way Analysis of Variance yielded an F computed value of 0.72 which is numerically lower than the F tabular value of 3.32 at 0.05 level of significance. Therefore, the null hypothesis that compliance level do not differ among the ethnic origins cannot be rejected, but is accepted as basis for conclusion. This result means that the respondents from different ethnic origins do not differ in compliance level about environmental laws. In other words, the ethnic origin whether Ilocano, Kalinga, Igorot or Ibanag has nothing to do with whether he or she is highly compliant or not with the environmental laws.

Table 11 Pearson rho Analysis of Relationships between Knowledge Level and Compliance Level

Variables	R ho	t-compute d	t tabula r at .05	Dec isio n	Conc lusio n
Knowledge Level and Compliance Level	0.904	31.961	1.960	Reject H_o	Positively Related

On the association between the respondent's knowledge level and compliance level (Table 11), the Pearson rho analysis yielded high positive correlation of $r = 0.904$ between the two variables. The t-test of significance yielded a t computed value of $t_c = 31.961$ higher than the t tabular value of 1.960 at .05 level of significance. Then, the null hypothesis is rejected and the alternative hypothesis is accepted as basis for conclusion. The findings suggests that as resident's knowledge about forestry laws increases, they are more likely to comply with these laws. This implies that understanding the forestry laws and regulations, their importance, and the consequences of non-compliance plays a crucial role in influencing their behavior about the environmental/forestry laws. Their increased knowledge often leads to more positive attitudes towards the laws. When residents understand the benefits of compliance for environmental conservation and their own livelihoods, they are more motivated to adhere to the regulations. This finding is supported by Simila et al., (2014). That knowledge is identified as the utmost imperative bottlenecks in the implementation of regulation on habitat conservation hence, proposal of applying smart regulation through more ambitious institutional arrangements for engagement with new third parties were made. The elevation of compliance with forest laws necessitates enhancing and strengthening positive social norms regarding community interaction with forests as well as education and awareness creation (Amankwa et al., (2024).

Table 12 Level of Implementation of Forestry Laws as Perceived by the three (3) Groups of Respondents

Respondents/ Area of Assessment	PNP and Local DENR		Community Residents		Barangay Officials	
	Mean	DI	Mean	DI	Mean	DI
a) Cutting, gathering/collecting timber	3.04	MI	2.84	MI	2.47	MDI

or other forest products w/out license						
b) Unlawful occupation or destruction of forest lands	3.18	MI	2.90	MI	2.78	MI
c) Pasturing livestock	3.13	MI	3.00	MI	2.67	MI
d) Chainsaw Law or Act	3.18	MI	2.99	MI	2.73	MI
Weighted Mean	3.15	MI	2.97	MI	2.60	MI

Legend: 3.26-4.00 Very Much Implemented (VMI)
 2.51-3.25 Much Implemented (MI)
 1.76-2.50 Moderately Complied (MDI)
 1.00-1.75 Not Implemented (NC)

In terms of the implementation of environmental laws, the results of the study (Table 12) revealed that the three groups of respondents perceive an implementation level of Much Implemented in all the four areas of environmental laws, except for the provisions on Cutting, gathering timber or other forest products without license which was perceived by barangay officials as Moderately Implemented.

The findings suggest that most of the forestry regulations or laws are being enforced well and they are being followed too hence, there are visible positive impacts on forest conservation and management in the study setting. This further implies that enforcement mechanisms are in place and operational as evident by a number of arrests of violators and confiscations made by the authorities on illegally cut timber and devices used in illegally cutting of timber/trees like chainsaws. While the laws are much implemented but not to the fullest extent possible, this indicates that there are still areas where the laws are not fully adhered to. This means that some areas of enforcement are well-monitored and strictly enforced, while others are neglected. This is evident on the existence of illegally cutting of trees, slash and burn practices and expansion of planting areas of farmers engaged in upland rice/corn planting and pineapple growing productions in the mountainous part of the study setting. Moreover, the insufficient funding, lack of trained personnel, inadequate infrastructure or technology to monitor and enforce laws effectively as well as lack of community engagements of the enforcers create a loopholes and opportunities for non-compliance.

As perceived by the Barangay officials, the rules on cutting, gathering timber or other forest products w/out license is moderately implemented. This finding suggests that while there are efforts to control illegal timber cutting and forest product collection, these efforts are not fully comprehensive or consistently applied resulting in occasional lapses in enforcement where people take advantage of gaps in enforcement. This further means that unauthorized cutting or collecting timber still persist in the study setting leading to ongoing issues with illegal exploitation of forest resources in the place. The findings are similar with the findings of Iksanov et al., (2021) where major forest violations is felling of trees without legal requirements and without registration documents.

Ramcilovic-Suominen et al., (2013) also found that the highest violation observed is the tree felling rule as a result of insufficient law enforcement. If law enforcement agencies are weak, the public will perceive the law as non-existent if law enforcement arms are strong and done consistently, then people perceive the law exists and will vow to follow the rules (Dekiawati 2022). Insufficient law enforcement and interventions from some key stakeholders to be factors that motivate culprits to commit illegal forest activities. Hence, there is a need to capitalize more in technological and human resources to fortify law enforcement capabilities (Gyamfi et al., 2025). Digital transformation is crucial to forest management and protection since forest rangers can acquire detailed information about who is managing or destroying the forest by using the modern technology and satellites (Rohmy et al 2024).

Table 13 Pearson rho Analysis of Relationships between Level of Compliance and Level of Implementation of Forestry Laws

Variables	R ho	t- com pute d	t tab ula r at .05	Dec isio n	Conc lusio n
Compliance Level and Implementation Level	0.853	16.729	1.960	Reject Ho	Positively related

On the association between the compliance level and implementation level of environmental laws (Table 13), the Pearson rho analysis yielded a positive correlation of $r = 0.853$. The t-test of significance of the relationship yielded a computed t value of $t_c = 16.729$ which is higher than the tabular value of 1.960, therefore the null hypothesis of no relationship is rejected and the alternative hypothesis of significant relationship is accepted as basis for conclusion. The result means that compliance and implementation go together. In other words, if there is higher implementation, there is higher compliance with the forestry laws and regulations. This further implies that when forestry laws are effectively implemented and enforced, it creates a strong deterrent against violations. Respondent's community residents are more likely to comply when they know that there is a high likelihood of being monitored and penalized for non-compliance. The findings are supported by Tacconi et al., (2019) where Brazil succeeded in significantly reducing deforestation through forest law enforcement. Forest law enforcement activities relied on a clear strategy that involved key elements that include workable and timely remote sensing imaging to recognize illegal deforestation, seizure of timber and forest apparatuses, suspension, fines, public disclosure of non-compliant behavior and the blacklisting of municipalities that were not reducing deforestation. Effective implementation can be done through engaging local communities in law enforcement because communities are in better position than law enforcement officers to detect illegal forest exploitation by outsiders (Brunner et al., 1999). The adoption of lateral, collaborative and co-management tactics in

forest law enforcement benefit from the positive effect of social norms and education on forest law compliance and community-enforced rules create a helpful impact on forest conservation. It likewise offers a unique mode modes of applying sanctions on violations against collective action rules in ways that protect the forest, as well as reforming law breakers for them to be ecologically responsible members of the community (Magno 1998) (Amankwa et al 2024).

CONCLUSION

It is concluded that the respondent forest-dependent communities are knowledgeable with the “forestry laws” such as rules on cutting, gathering/collecting timber without license, unlawful occupation or destruction of forest lands, pasturing livestock and the provisions of the Chainsaw Law and they are compliant with these laws. The knowledge, compliance and the enforcement of these laws could lead to the protection and preservation of the forest resources in the study setting. However, it is concluded that economic pressures or financial constraints, insufficient alternative livelihood, and the economic incentives offered by forestry resources outweigh the perceived benefits of compliance. Also, the gaps in monitoring or limited manpower and technical resources of the authorities to enforce the laws hinder effective and comprehensive enforcement efforts. Addressing these flaws and leveraging the gaps as well as active and robust engagement of the stakeholders in the study setting can enhance the compliance and effectiveness of forestry laws thus contributing to a more sustainable environmental management.

Based from the conclusion of the study it is suggested that the Local Government Units, the Local Environment Officers and Schools in the study setting should conduct continuous education campaign to the community about the importance of forestry laws targeting younger residents and lower-income individuals to bridge the knowledge gap. Secondly, the provisions of more alternative livelihood programs and sustainable income-generating activities that caters especially low-income families in the study setting to reduce dependence on forest resources that lead to non-compliance shall be considered. Third, relentless and aggressive enforcement of the forestry laws by the authorities with emphasis on intelligence gathering about violators and potential violators; Engage the local communities by organizing group of individuals (Bantay Kalikasan) in the forest dependent communities composed of barangay officials, public spirited citizens and civil society groups advocating the protection of the environment to reinforce law enforcers in the protection of forest resources; and lastly, the Enforcement authorities like the Police, DENR and LGU may consider the use of advanced monitoring technology such as remote sensing to support forest management and conservation.

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