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# Assessing inequality effects of forest income and implications to rural household in the Province of Cagayan

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**Key words:** Forest income, Non-forest income, Forest dependence, FGT index, Poverty.

**Abstract**

This study attempted to analyze the effect of forest income of rural households in the Cagayan Province, Philippines. The sample for analysis consists of 691 household-respondents. FGT was estimated in order to examine the income inequality and the poverty situation among the forest-dependent households with and without forest income. To analyze the factors related to the households' forest dependence, an ordinary least squares regression analysis was conducted. In this study, forest dependence was expressed as the relative share of forest income to the total household income. On the average, poverty headcount or the number of households below the threshold level was greater if forest income was not accounted for. The significant factors that determine forest dependence are years of schooling of the household head, distance of the household from the clinic, size of the land owned by the household, machine value, distance of the household from the market, and distance of the household from the forest. All these factors have negative effect on forest dependence. Forest dependence has unequalizing effect to household income. It has become a source of income inequality among the rural households. However, this is not to say that forest dependent households must refrain from being forest dependent. Moreover, most of the non-forest income sources of the households are activities related to agriculture. This dependence makes the households vulnerable to natural shocks. It is therefore recommended that households should diversify its livelihood strategy such that not all of its activities are farm-based and forest-based. Rendering of skilled job, which may necessarily prompt a household member to migrate, can be an option. Moving away from the farm to work in the formal sector may be a reliable and more stable source of income.

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**Introduction**

In year 2000, the 191 heads of member -states of the United Nations affirmed that they would "spare no effort to free our fellow men, women and children from the Object and dehumanizing conditions of extreme poverty, to which more than a billion of them are currently subjected" (UN, 2000). Thus, they committed themselves in the Millennium Development Declaration to making the right to development a reality for everyone by year 2015. The objective of the declaration is to promote a comprehensive approach and a coordinated strategy to tackle many problems simultaneously across a broad front (United Nations, 2005).

Millennium Development Goal (MDG) 7 aims to ensure environmental sustainability based on the notion that human survival and prosperity critically depend on the sensible use of natural resources and the protection of complex ecosystems. Yet this foundation of human existence is threatened by alarming rates of land degradation and a changing climate. Environmental degradation has disproportionate impacts on the poor, who often rely on the natural resources in their immediate surroundings for day-to-day subsistence and livelihood.

Indeed, forests play a profound role in the livelihood of developing countries especially those living in the rural areas. There are about 2.4 billion people who continue to depend on biomass fuels like wood, dung and agricultural residues to be able to meet their basic energy needs for cooking, boiling water, lighting and, depending on climatic conditions, space-heating worldwide [International Energy Agency (IEA) and Organization for Economic Co-operation and Development (OECD) 2004]. Considerable pressure on forests would result from reliance on wood for fuel, particularly in areas where biomass is scarce and the demand for wood outweighs natural re-growth. Depending on the environmental context, deforestation is a driving force for land degradation and desertification.

In the Philippines, as of 2003, the forest cover is estimated to be 7.2 million hectares or merely 20 percent of the country's total land area of this, about 75 percent is production forest or forests lands used for the production of timber and other forests products. The remaining 25 percent is protection forest or forests on fragile lands and those protected for plant and animal biodiversity conservation (FAO, 2009). As of 2011, classified forestlands covered 15.05 million hectares or 50 percent while unclassified forestland covered 0.755 million hectares or 3 percent. Alienable and disposable lands span 14.19 million hectares or 47 percent.

The classified forestland which is mainly for forest use is further categorized into established timberland (10.056 million hectares or 69 percent); established forest reserves (3.270 million hectares or 22 percent); national parks, game refuge and bird sanctuaries, and wilderness areas (1.34 million hectares), military and naval reservations (0.126 million hectares), civil reservation (0.166 million hectares), and fishponds (0.091 million hectares). About 755,000 hectares are still unclassified forestland the use of which has not been determined (Philippine Forestry Statistics, 2011). Poverty in the world is concentrated in rural areas, and rural households, particularly in developing countries, depend on the environment for at least some of their income (Angelsen *et al*., 2011; Cavendish, 2000; World Bank, 2002; WRI, 2005). Nevertheless, the relationship between environment and poverty is complex as environmental goods and services can play different roles in rural households' livelihood strategies (WRI, 2005).

In a detailed account of the links between poverty and forests, Angelsen and Wunder (2003) argue that forest resources can play different roles in a household's livelihood strategy; they can act as 'safety nets' or 'gap fillers', but they might just as easily become poverty traps. Furthermore, households' resource-use behavior can be quite diverse both within and across communities implying that while extraction from the environment can be the main source of income for some households, others in the same village might not extract at all (Coomes and Barham, 1997; Fisher *et al*., 2005). In any case, income from environmental resources can be of vital

importance to people in rural areas even if its contribution to total income is relatively small (Mammo *et al.*, 2007).

In the Philippines, poverty is largely a rural phenomenon. The poverty rate in rural areas is almost three times higher than in urban areas. About half of all Filipinos are living in the rural areas and the other half are living in the urban areas, that is, more than seven out of ten are living in rural areas.

According to the National Statistics Coordination Board (NSCB), the poverty incidence among families in the Philippines is 22.3 percent in 2012. In Region 2, poverty incidence is 19.8 percent in 2012. Among the provinces in the region, poverty incidence is highest in Quirino province at 21.7 percent and lowest in Nueva Vizcaya at 17 percent. The province of Cagayan has a poverty incidence of 17.7 percent (NSCB, 2012). This regional comparison indicates that the region's poverty status is better than the country as a whole.

The per capita poverty threshold in 2012 is PhP 9,385.00 at the national level which is lower compared to that of Region 2 at PhP 9,503.00. Among its provinces, the province of Nueva Vizcaya has the lowest per capita poverty threshold at PhP 9,283.00 followed by the Province of Cagayan at PhP 9,341.00 (NSCB, 2012).

The World Bank reported in 2004 that, of the 52 percent of the country's population living in rural areas, 22 percent reside in or near forests. Majority of these Filipinos rely on forest resources for their livelihood. Another estimate says that about 24 to 30 million Filipinos are directly dependent on forest resources while 20 million live on land classified as public forest (FAO 1998 citing Lynch and Talbott (1995). It is important to note that forest dependence is not a problem per se. It is the focus of this study because forests contribute significantly to the livelihood of households, on the one hand, while people's dependence on forests can lead to their degradation, on the other. In view of the aforementioned, the following questions are posed particularly for Cagayan Province in Region 02: How poor are the forest dependents? How dependent are the communities on the forests for their livelihood? What are the factors that determine this forest dependence?

To answer these questions, this study aimed to assess the economic dynamics of poverty- forest dependence link in the Province of Cagayan. Specifically, the objectives are to characterize the households in terms of their socio-demographic characteristics, access to social services, asset status and the conditioning factors in the communities; to describe and assess the nature and degree of forest dependence of the communities; determine the factors affecting poverty and forest dependence; and to provide policy recommendations to address forest dependence and poverty in the rural communities.

**Materials and methods**

*Study Site*

The focus of this research is Cagayan province in Region 2, Philippines where the three municipalities of Gonzaga, Lallo, and Baggao were purposively selected (Fig. 1). These municipalities are in the eastern part of the province along the foot of the Sierra Madre Mountains. Residents are mostly Ilocanos. However, immigrants from the Cordilleras such as the Igorots, Aetas, and Agtas are present in the mountain areas. The main dialects of the people are Ilocano, and Igorot, Ibanag, and Itawes. Main crops for home consumption and sale are rice, corn, vegetables, and root crops. The mountain ranges yield timber as well as non-timber forest products such as rattan, bamboo, and other products for furniture making.

These municipalities were selected based on two considerations. First, they are located near and along the Sierra Madre mountain range where forests resources are found. Economic activities such as extraction and processing are undertaken by rural households in these areas. Second, logging of old growth forests took place in these municipalities in recent years, hence, opened up the forests to the communities for collection of available forest products.


**Fig. 1.** Map of Cagayan province showing relative locations of the study sites, 2010.
**Source:** Google maps, 2010.

*Sources of Data*

*Secondary Sources*

The secondary data sources provided general information on the bio-physical and socio-economic characteristics of the province of Cagayan with emphasis on the municipalities of Gonzaga, Lallo, and Baggao. Data sources included documents gathered from different government offices such as the National Economic and Development Authority (NEDA) Regional Office in Tuguegarao, Cagayan, and the Municipal Planning and Development Office (MPDO) in the municipalities of Gonzaga, Lallo, and Baggao. Documents from the Department of Environment and Natural Resources (DENR) Regional Office-Tuguegarao, Provincial Environment and Natural Resources Office (PENRO-Tuguegarao), and from Municipal Environmental Resources Office (MENRO) of the three municipalities were also used. Documents published by the DENR such as the Philippine Forestry Statistics and information on poverty published by the National Statistical Coordination Board (NSCB) were also used in the study.

*Primary Sources*

The primary data used in the study were gathered by conducting a field survey of selected households in the municipalities of Gonzaga, Lallo, and Baggao. Respondents were interviewed using an open-ended questionnaire to elicit pertinent information the socio-demographic profile of the households included information on age, gender, highest educational attainment, number of years in the barangay, and size of household. Data collected on welfare status of households included the kilometer-distance of household from the school, distance from clinic or a hospital, and distance from the source of potable water. Information on household assets included size of land owned and the value of livestock such as working and non-working animals. Working animals include water buffalo (carabao), cow or horse while non-working animals were domesticated animals such as goat, poultry, and swine.

The income profile of the households was determined according to their sources. Income from other sources includes crop income (per cropping), income from unskilled labor, skilled labor income, remittances received, and sales of assets. Total forest income is the income realized from the sale and own-consumption of forest products such as wild plants/fruits, animals, ornamental plants, bamboo, rattan, timber, lumber, fishes, shells, charcoal, wood craft, and other products coming from the forest.

*Selection and Description of Respondents*

Seven barangays were purposively selected in the municipality of Gonzaga, three from Lallo, and five from the municipality of Baggao. It is important to note that purposive samples are common when researchers want to collect in-depth, reliable data in a small geographical area (Fisher, 2004). Purposive sampling can be very useful for situations where there is a need to reach a targeted sample quickly.

*Data Gathering*

Questionnaire for the socio-economic survey was prepared to gather the necessary information relevant to the study. Actual ocular visits to the forests sites were done to observe and to gather first- hand information about the forest activities of the household-respondents. In the study, however, due to extended interview period and unwillingness of respondents to participate, the sample for analysis was reduced to 691 household-respondents.

*Analytical Tools*

Descriptive analysis of the socio-economic characteristics, access of households to social services, asset status of the forest dependent-households, and the conditioning factors was conducted by analyzing the means, standard deviations, frequency counts and percentage distribution. Test of mean differences was indicated by the F-test statistic.

*1. Measurement of forest environmental income and degree of forest dependence*

The World Bank Environment Department (2004) proposed some measures which are relevant to the analyses of forest environmental income, forest dependence, and poverty. These basic measures guided this study in quantifying forest dependence of households in the Province of Cagayan.

*a. Measuring Total Forest Income*

Total forest income (TFI) is forest environmental income, in both consumption and cash forms, from all environmental income sources and products. Cash forest environmental income (ACFI) is the cash component of AFI and absolute subsistence forest environmental income (ASFI) is the consumption component of AFI. Thus, AFI = ACFI + ASFI. In this study, absolute forest income (AFI) included all cash forest income from the sales of forest products and non-cash or subsistence income or own-consumption of forest products. Forest environmental income is the income realized from the sale and own-consumption of forest products such as wild plants/fruits, animals, ornamental plants, bamboo, rattan, timber, lumber, fishes, shells charcoal, wood craft, and other products coming from the forest. The direct approach or market value approach was used in valuing forest products, both timber forest products and non-timber forest products. This means that valuation depends upon the prevailing market price.

*b. Measuring Forest Dependence*

In this study, the income of households from other sources included crop income, income from rendering skilled or unskilled work, sales of assets, and remittance.

This is also referred to as non-forest income. Thus, the total household income consists of non-forest income and total forest income (TFI).

Forest dependence is then determined by relating total forest income (TFI) to income from all sources. Specifically, to determine the degree of forest dependence, total forest income was expressed as relative share of the total household income. Thus, lower values indicate lesser dependence and higher values, greater dependence on forest. This study proposed that the degree of forest dependence is categorized as low, medium, and high. There is low dependence if the relative value of forest income to total household income is from zero to 30 percent, medium dependence if value is from 31 percent to 50 percent, and high dependence if value is from 51 percent to 100 percent.

In a study conducted by Johda (1986) regarding the link between environmental income and the poor in India in 1986, he found that poor rural households on average derived 9 to 26 percent of their income from common property natural resources. His study suggested that the community forests in India, however degraded, were important to the livelihoods of the poor. Cavendish (2000) studied income obtained by households in rural Zimbabwe from all sources over two periods of time in an agro-pastoral area that cannot be classified as resource rich.

He found that 35 to 37 percent of rural households' income came from environmental sources. In 1996-97, the richest 20 percent of households obtained about 30 percent of their income from nature. For the poorest 20 percent of households, 44 percent of total income could be considered environmental. He concluded that "environmental income over and above income sources normally captured by rural household surveys would have boosted measured mean income by as much as 47.3 percent in 1993–94 and 46 percent in 1996-99. These results were used as benchmark in arriving at the different categories of forest dependence in the study areas.

*2. Determinants of Forest Dependence*

To determine the effects of the different independent variables on the dependent variable, forest dependence, the regression equation is in the form

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta n\, Xn + \varepsilon$$

Where Y is the dependent variable, the Xs are the independent variables, the *ßs* are the unknown coefficients that measure the effect of the independent variables on forest dependence and *e* is the error term. In this study, the dependent variable is forest dependence and the independent variables are socio-demographic status of households, access of households to social services, asset status, and conditioning factors. Conditioning factors include distance of household to the nearest market and distance of households to the nearest forest.

The variables and how they are measured are shown in Table 1.

**Table 1.** Description of variables for forest dependence.

| Variable | Description of Variable | Expected Sign |
|---|---|---|
| Dependent Variable | | |
| Forest dependence | Degree of forest dependence with values from zero to 100 percent | |
| Independent Variables | | |
| Age | Age of the respondent as of most recent birthday (in years) | + |
| Gender | Female = 1, 0 otherwise | + |
| Year of schooling | Number of years in formal schooling | - |
| Residency | Number of years residing in the community | - |
| Distance to clinic | Kilometer distance of the respondent's house to the nearest health clinic | + |
| Size of land owned | Size of land owned by the respondents in hectare | - |
| Machine value | Purchase value of hand-held tractor in pesos | - |
| Distance to market | Kilometer distance of the respondent's house to the nearest public market | - |
| Distance to forest | Kilometer distance of the respondent's house to the nearest forest | - |
| Distance to school | Kilometer distance of the respondent's house to the nearest school | + |
| Carabao value | Market value of water buffalo owned by the respondent in pesos | + |

The model was estimated using Ordinary Least Squares (OLS) method since the goal of the analysis is to determine the values of the ß parameters that minimize the sum of the squared residual values for the set of observations. By examining the magnitude and signs of the regression coefficients (*β*), inference on how predictor variables or independent variables affect the dependent variable, can easily be made. Data management was done using STATA 8.2.

*3. Measurement of Poverty Status of Households*

*a. The Foster-Greer-Thorbecke poverty index (FGT)*

To analyze the distributional and poverty implication of forest income, three variants of the Foster-Greer-Thorbecke poverty index (FGT) were employed (FGT 1984). The FGT index was used because it is very easy to decompose by income effects, and it also satisfies Sen's axioms of transfer and monotonicity (Sen, 1976).

This means that the index increases whenever a pure transfer is made from a poor person to someone with more income, and increases when there is a reduction in a poor person's income, holding other incomes constant. The FGT poverty index is:

$$\mathbf{P\alpha} = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-yi}{Z}\right)^{\alpha} \quad (1)$$

Where $\alpha \geq 0$

Where, y = ( y1, y2…$y_n$ ) represents the income vector of a population of *n* individuals with incomes sorted in increasing order of magnitude, $Z^1$ is the poverty line, *q* is the number of poor individuals, and α is a weighting parameter that can be viewed as a measure of poverty aversion. It usually ranges from 0 to 2 (i.e., $0 < \alpha < 2$). When $\alpha = 0$, the FGT index reduces to the poverty head count ratio (i.e., the percentage of poor in the population).

When α = 1, the FGT index measures the average poverty gap ratio (i.e., the average shortfall of income from the poverty line or how far below the poverty line the average poor household's income falls).

However, when α = 2, the FGT index indicates the severity of poverty or the spread of the poor around the level of the average poor. Generally, as α increases, the FGT index gives more weight to the lowest incomes. Foster *et al*. (1984) presented a decomposition of the poverty index by population subgroup, while Reardon and Taylor (1996) proposed a simulation method to decompose the FGT poverty coefficient by income source (Fonta *et al*., 2010, citing Lopez-Feldman *et al*., 2007). The 2009 poverty threshold, which is PhP 16,841, was used to determine poverty head count, poverty gap, and poverty severity.

*b. Income Decomposition Analysis Using Gini Index*

To determine the contribution of each income source to income inequality in the municipalities, the methodology proposed by Lerman and Yitzhaki (1985) was applied. They showed that the Gini coefficient for total income inequality, *G*, can be represented as:

$$G = \sum_{k=1}^{k} S_K G_K R_K \quad (2)$$

Where *Sk* represents the share of component *k* in total income, *Gk* is the source Gini corresponding to the distribution of income from source *k* and *Rk* is the Gini correlation between income from source *k* and the distribution of total income. Equation (2) therefore allows the decomposition of the influence of any income component; in this study, forest income, upon total income inequality, as a product of three easily interpreted terms, namely: (i) how important the income source is in total income ($S_k$ ); (ii) how equally and unequally distributed the income source is ($G_k$); and (iii) how the income source and the distribution of total income are correlated ($R_k$). Fonta *et al* citing Lerman and Yitzhaki (1985) showed that by using this particular method of Gini decomposition, the effects of a small change in income from any source say *k*, can be estimated, holding income from all other known sources constant. This effect is given by:

$$\frac{\partial G/\partial ek}{G} = \frac{S_k R_k G_k}{G} - S_{k\,(3)}$$

Which shows that an infinitesimal change in income *k* has equalizing (un-equalizing) effects if the share of the Gini explained by that source income is smaller than its share in total income.

*Discussion of results*

*The Forest-Dependent Households*

*Socio-demographic Status of Forest -Dependent Respondents*

The over- all mean age of the forest dependent households in the province was 46 years old indicating that they are capable of doing activities in the forest to generate income. There were young as well as old forest dependent households. The youngest forest dependents was 19 years while the oldest was 75. The- F test indicates that the mean ages among the municipalities differ significantly at one percent level.

The average number of years of schooling was highest in Baggao (8.35), followed by Gonzaga (6.59) and then by Lallo (5.18). The maximum years of schooling of the residents as 14 years, which is the same for Baggao and Gonzaga. All three municipalities had household heads that did not have any education at all.

The educational level of the forest dependents was observed to be fairly low, averaging only seven years or equivalent to elementary graduate. There were those who were not able to attend any formal schooling. Others finished college level. Nonetheless, for those who finished college degree, they opted to remain in the rural sector because of the difficulty of finding employment in the formal sector. The mean numbers of years of schooling in the three municipalities differ significantly at one percent probability level.

There were respondents in Baggao who reside in this municipality for 75 years already. The maximum number of years of residence of a household head in Gonzaga and Lallo were 67 and 66 years, respectively. Gonzaga residence was least with an average of 29 years.

On the average, there were five household members in both Baggao and Gonzaga; the mean number of respondents in Lallo was four. Gonzaga had the most number of household members which was 14, while Lallo had the least at seven. The minimum number of household members was one. As to the average size of households, all municipalities were almost the same. This is similar to the national average household size which is five members. In terms of the frequency distribution of household head gender, most of the respondents from the three municipalities were male (Fig. 2). In Baggao, 96.71 percent of the respondents were male. On the other hand, 87.79 percent and only 58.41 percent from Gonzaga and Lallo, respectively, were male.

**Table 2.** Socio-demographic characteristics of forest- dependent households, 691 respondents, Cagayan Province, 2010.

| Characteristic | Descriptive Statistic | Municipality | | | | F-Test Stat [a] | P-Value |
|---|---|---|---|---|---|---|---|
| | | Baggao | Gonzaga | Lallo | All | | |
| | Number of Observations | 365 | 213 | 113 | 691 | | |
| Age | Minimum | 20 | 19 | 25 | 19 | | |
| | Maximum | 75 | 73 | 75 | 75 | | |
| | Mean | 46 | 43 | 54 | 46 | 28.96 | 0 |
| | Std. Deviation | 12.06 | 11.81 | 10.34 | 12.18 | | |
| Number of years of schooling | Minimum | 0 | 0 | 0 | 0 | | |
| | Maximum | 14 | 14 | 13 | 14 | | |
| | Mean | 8.35 | 6.59 | 5.18 | 7 | 49.23 | 0 |
| | Std. Deviation | 3.6 | 3.16 | 1.6 | 3.4 | | |
| Number of years residing in the community | Minimum | 0 | 1 | 1 | 0 | | |
| | Maximum | 75 | 67 | 66 | 75 | | |
| | Mean | 36.01 | 28.88 | 46.83 | 35.6 | 43.83 | 0 |
| | Std. Deviation | 16.61 | 17.34 | 14.2 | 17.47 | | |
| Total number of household members | Minimum | 1 | 1 | 2 | 1 | | |
| | Maximum | 11 | 14 | 7 | 11 | | |
| | Mean | 4.53 | 4.58 | 3.88 | 4.4 | 8.04 | 0 |
| | Std. Deviation | 1.75 | 1.63 | 1.12 | 1.6 | | |

[a] All tests of mean differences show significance at 1% probability level.

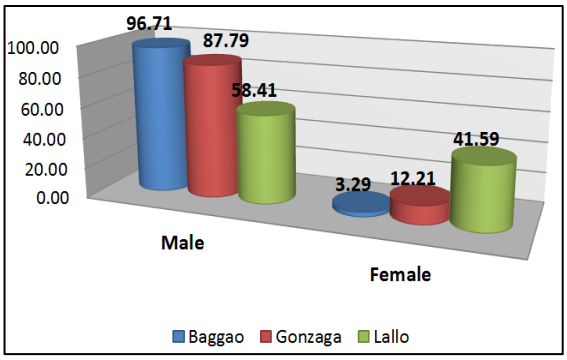


**Fig. 2.** Frequency distribution of household heads by gender (in percentage).

*Access of Households to Social Services*

The Asian Development Bank (ADB, 2005: 10) defined poverty as a deprivation of essential assets and opportunities to which every human is entitled. Everyone should have access to basic education and primary health services. Poor households have the right to sustain themselves by their labor and be reasonably rewarded, as well as to have some protection from external shocks. Beyond income and basic services, individuals and societies are also poor – and tend to remain so – if they are not empowered to participate in making decisions that shape their lives.

Evidently, access to health service providers such as clinic and hospital is limited and difficult to forest-dependent households in the Cagayan province**.** On the average, they have to travel five kilometers to reach the nearest clinic and 14 kilometers to reach the nearest hospital. Clinic is farthest in the municipality of Lallo, eight kilometers; and nearest in the municipality of Baggao, three kilometers. Based on the results, the average distance of a house to the nearest clinic is 2.90 kilometers for Baggao, 6.37 kilometers for Gonzaga, and 8.05 kilometers for Lallo.

The nearest distance of a house to the clinic is only 0.02 kilometer which is in Baggao, while the farthest are in Gonzaga and Lallo (18 kilometers).

The average distance of a house in Baggao, Gonzaga, and Lallo to the nearest hospital is 13.08 kilometers, 11.87 kilometers, and 23.98 kilometers, respectively. Obviously the nearest is in Gonzaga. The greatest distance among the three municipalities is 32 kilometers which is in Lallo while the least distance among the three municipalities is 0.20 kilometer which is in Lallo as well.

Geographic distance to health service providers limits the households' access to important health services. Rural residents are vulnerable to infectious diseases including tuberculosis, hepatitis, dengue fever, pneumonia, cholera, and malaria. They are also vulnerable to economic shocks that undermine their earning capacity. Moreover, geographic distance is also affected by transportation and communication. Given the distances of the forest dependent-households from clinic and hospital, they will not be able to avail health care services immediately. Hence, they may consult local healers or "arbularyos". They usually recommend plants or herb, or animals as medicines which could be gathered in the forests.

In all of the municipalities, there is a rural health unit or a health center under the local government. There are also private medical clinics but they cater to out-patients only. Given these conditions, the behavior of the residents to consult local healers or *"albularyos"* who usually recommend plants or herbs or animals as medicines, is reinforced. While the role of local healers cannot be discounted as to rendering medical service, under certain circumstances such as emergency cases of illnesses and injuries, access to clinics and hospital is crucial.

The F- test statistic shows that the distances to the nearest clinic are different among the municipalities at one percent level of significance. This is also true for distance of residence to the nearest hospital.

On the average, the forest-dependent households are five kilometers away from the nearest school. Usually, these are primary schools which cater to four grade levels only, that is, grade one to grade four. School is farthest in the municipality of Lallo which is 13 kilometers, on the average. The average distance of the respondent's house to the nearest school is 4.89 kilometers for Baggao, 1.95 kilometers for Gonzaga and 12.70 kilometers for Lallo. Among the three municipalities, Lallo has the largest maximum distance which is 25 kilometers. Some households in the three municipalities are very close to the school, less than one kilometer.

In all municipalities, households are relatively near to a school. This reflected the national program on education for all instituted by the government back in the 1990s which sought to establish one elementary school in every barangay nationwide. In 1990, there was a World Declaration on Education for All (EFA) in Jomtiem, Thailand, which prescribed that Basic Learning Needs shall be met for all by various means. As a response, the Philippines crafted and implemented the 10-year EFA Philippine Plan of Action covering the period 1991-2000. The EFA plan articulated the country's national goals, objectives, policies and strategies, as well as the regional programs for implementation for the first decade of the EFA movement. Among the thrusts is universalization of quality primary education.

As to their access to potable water, on the average, households are very near to the source with one hundred meters (0.1 kilometer). Result showed that the average distance of a household to a water source in Baggao, Gonzaga, and Lallo are 0.02 kilometer, 0.12 kilometer, and 0.28 kilometer, respectively.

There were seven types of water sources in the communities, namely: pump well, spring, jetmatic, open well, artisian, the local water utility system, and deep well. A large percentage of households in Baggao use jetmatic (41.90 percent), followed by pump wells (24.90 percent), and spring (3.80 percent).

On the other hand, in Gonzaga, the top three water sources are deep well (72.80 percent), spring (23.50 percent) and Gonzaga Water District (GWD) (2.80 percent). Lastly, in Lallo, the top three water sources are pump well (62.83 percent), spring (20.35 percent), and deep well (16.8 percent). The sources of potable water which are common among the three municipalities were pump well, deep well and spring. The reliance of households from spring as source of potable water suggests that they are living near the forest where usually springs are found. The indicators of access of households to social services include distance to the nearest clinic, distance to the nearest hospital, distance to the nearest school, and distance to the source of potable water. Generally, the households have limited access to the basic social services such as health and education. They have limited access considering the distance that they have to travel to avail of these services.

**Table 3.** Average distances of households to nearest clinic, hospital, school, and source of potable water, 691 household-respondents, Cagayan Province, 2010.

| Characteristic | Descriptive Statistic | Municipality | | | | F-Test Stat[a] | P-Value |
|---|---|---|---|---|---|---|---|
| | | Baggao | Gonzaga | Lallo | All | | |
| Distance of resident's house to the nearest clinic (km) | Mean | 2.9 | 6.37 | 8.05 | 4.8 | 92.69 | 0 |
| | Std. Deviation | 1.81 | 5.25 | 6.1 | 4.5 | | |
| Distance of resident's house to the nearest hospital(km) | Mean | 13.08 | 11.87 | 23.98 | 13.9 | 115.89 | 0 |
| | Std. Deviation | 8.26 | 5.64 | 6.86 | 8.4 | | |
| Distance of respondent's house to the nearest school (km) | Mean | 4.89 | 1.95 | 12.7 | 5.2 | 237.34 | 0 |
| | Std. Deviation | 3.28 | 1.64 | 8.45 | 5.5 | | |
| Distance of the respondent's house to source of potable water (km) | Mean | 0.02 | 0.12 | 0.28 | 0.11 | 5.31 | 0.01 |
| | Std. Deviation | 0.02 | 1.17 | 0.2 | 0.68 | | |

[a] All tests of mean differences show significance at 1% probability level.

*Asset Profile of the Household-Respondents*

Ownership of assets by the rural households is part of their livelihood strategy. Their vulnerability to economic as well as natural shocks requires them to hold assets which could readily be available and can be sold in the market.

The households owned productive assets. Productive assets are those that can be utilized to undertake production activities. They include working animals such as water buffalo, cow, farmland, and hand-held tractor. A common asset which the households in all municipalities owned, are water buffalo, hand-held tractor, house, and farmland. Ownership of cow and other livestock was only found in Gonzaga.

In terms of the total mean value of the assets owned, households in the municipality of Lallo had the highest with PhP 85,956 while Baggao had the lowest with PhP 30,862.

The differences in the total mean value is attributed to the fact that not all of the assets are owned by households in Baggao where they did not have cow and other livestock. While households in Gonzaga had more productive assets, their mean values are also low. Lallo appears the wealthiest municipality in terms of assets owned because the mean value of house owned is high. This picture will change, however, if the value of land is factored in. Apparently, households in Lallo have smaller size of farmland (0.43 hectare) while Baggao has the highest (1.51 heatares), on the average.

The assets which are common to the households were water buffalo, hand-held tractor, house, and farmland. House and water buffalo appeared to be the most valuable assets of the households among the three municipalities. Gonzaga had the highest total mean value of assets at PhP 76,676 followed by Baggao with PhP 30,862.

These differences in assets reflect the reality that households have varied set of choices. The diversity of the assets also indicates their investment decisions. Hence, their decision to diversify is subjected to several conditions such as which asset can contribute more to household productivity, which asset is more liquid or can easily be sold during economic shocks and, which asset does not impose high cost to the households.

Generally, the asset profile of the households indicates that they are limited to undertake income-generating activities such as farming or growing commercial cash crops and other livestock. Thus, they continue to be poor and depend upon the forest to augment their income- generating activities.

**Table 4.** Average value of selected assets of forest dependent households, 691 household-respondents, Cagayan Province, 2010.

| Characteristic | Descriptive Statistic | Municipality | | | | F-Test Stat[a] | P-Value |
|---|---|---|---|---|---|---|---|
| | | Baggao | Gonzaga | Lallo | All | | |
| Water buffalo(PhP) | Mean | 2,619 | 13,833 | 4,876 | 6,423 | 107.69 | 0.00 |
| | Std. Deviation | 6,114 | 11,596 | 10,714 | 10,224 | | |
| Cow (PhP) | Mean | | 8,639 | | 2,663 | - | - |
| | Std. Deviation | | 17,675 | | 17,674 | | |
| Other livestock (PhP) | Mean | | 22,406 | | 6,907 | - | - |
| | Std. Deviation | | 21,672 | - | 21,672 | | |
| Hand- held tractor (PhP) | Mean | 3,048 | 2,712 | 3,027 | 2,937 | 0.09[n.s.] | 0.91 |
| | Std. Deviation | 9,868 | 7,793 | 10,393 | 9360 | | |
| House (PhP) | Mean | 25,195 | 29,087 | 78,053 | 33,734 | 3.91 | 0.05 |
| | Std. Deviation | 40,160 | 31,777 | 25,203 | 40701 | | |
| Total value of assets | | 30,862 | 76,676 | 85,956 | 52,667 | | |
| Size of farm land (hectare) | Mean | 1.51 | 1.27 | 0.43 | 1.2 | 18.68 | 0.00 |
| | Std. Deviation | 1.81 | 1.57 | 0.92 | 1.6 | | |

[a]Tests of mean differences show significance at 1% probability level except for hand-held tractor which is at 5% probability level.

[n.s.] Not significant

*Conditioning Factors*

Public market is a place intended by the government as formal institution for the marketing of products. There is a regular schedule of market days during the week in each of the public markets. In the municipality of Lallo, it is during Tuesdays and Fridays, and Wednesdays and Sundays for Gonzaga. This is also the schedule in Baggao. While there are also" talipapa" or small stalls as display area in the barangays, there are respondents who opt to go to the public market for opportunities of higher price of their products such as wild plants, fishes, fresh water shrimps, and shells.

On the average, forest-dependent households are nine kilometers away from the public market. Households in the municipalities of Lallo and Baggao are farthest with a mean distance of 13 kilometers and 12 kilometers, respectively. Households in Gonzaga are nearest to the public market with an average distance of five kilometers.

The- F test statistic indicates that the mean distances are significantly different among the three municipalities at one percent level of significance. This further implies that forest-dependent households differ in the costs they incur when they bring their forest products to the market. These differences in the distance from the market may affect households' decision to extract more resources from the forest to compensate the additional cost of going to the market.

Forest-dependent households are near the forest with an average distance of 4.8 or about five kilometers. Forests are nearest to households in the municipality of Lallo with an average distance of only 0.84 kilometer and farthest in the municipality of Baggao, with an average distance of five kilometers.

The F- test statistic indicates that the mean distances are significantly different among the three

municipalities at one percent level of significance. This further implies that forest-dependent households differ in the costs they incur when they go to the forest. Moreover, for households living near the forests, they can spend more time gathering forest products which may eventually result to higher forest income. They can become more familiar with the forest due to their proximity and hence, may further condition them to depend more upon the forest as source of their livelihood.

**Table 5.** Average distances of households to nearest public market and nearest forest, 691 household-respondents, Cagayan Province, 2010.

| Characteristic | Descriptive Statistic | Municipality | | | | F-Test Stat[a] | P-Value |
|---|---|---|---|---|---|---|---|
| | | Baggao | Gonzaga | Lallo | All | | |
| Distance of respondent's house to the nearest public market (km) | Mean | 11.63 | 4.71 | 12.94 | 9.05 | 189.64 | 0 |
| | Std. Deviation | 5.55 | 2.31 | 4.11 | 5.6 | | |
| Distance of the respondent's house to the nearest forest (km) | Mean | 4.93 | 3.11 | 0.84 | 4.8 | 128.9 | 0 |
| | Std. Deviation | 2.19 | 3.18 | 1.5 | 3.7 | | |

[a]All tests of mean differences show significance at 1% probability level.

*Effect of Forest Income on Poverty*

The World Bank (2000) defines poverty as a pronounced deprivation in well-being. To be poor is to be hungry, to lack shelter and clothing, to be sick and not cared for, to be illiterate and not schooled. Since it has many dimensions and manifests itself in different kinds of deprivation, there are several measures of poverty and are classified as income-based or outcome-based, depending on whether they measure means or end.

Income-based measures use a poverty line usually defined in terms of having enough income to spend on a specified minimum amount of food and non-food basic items of expenditures. Outcome-based measures focus on the absence or lack of some minimum acceptable level of basic needs or lack of some basic capabilities to function. Access to social services such as health and education is also indicative of extent of poverty of the people.

Based on Republic Act 8425, otherwise known as the Social Reform and Poverty Alleviation Act of 1997, the poor refers to individuals and families whose income fall below the poverty threshold as defined by the government and/or those that cannot afford in a sustained manner to provide their basic needs of food, health, education, housing and other amenities of life."

The poverty threshold "refers to the minimum income/expenditure required for a family/individual to meet the basic food and non-food requirements".

*Poverty Head Count, Gap and Severity*

In order to estimate the impact of forest income on poverty, the poverty index proposed by Forster *et al.* (1984), FGT was used. Poverty headcount, gap, and severity were estimated for two cases with and without forest income. Using the 2009 poverty threshold which is PhP 16, 841, 22 percent of the households in Cagayan province are below the poverty threshold with forest income. However, without forest income, their number increases to 78 percent. As to the poverty gap, households have an income shortfall of 9 percent with forest income but this becomes 39 percent without forest income. The severity of poverty is estimated at 5.4 percent without forest income. This implies that there is 5.4 percent inequality among the poor. Without forest income however, the severity of poverty worsen to 25.6 percent.

The effect of forest income on poverty in the municipality of Baggao is shown. Results show that 4.4 percent of the sample households in Baggao are below the 2009 poverty threshold established by the government, which is PhP 16,841 or about US$398.99. The national poverty threshold level was used so that comparing the poverty status of the province in relation to any part of the country become easier.

**Table 6.** FGT index with and without forest income by municipality, 691 household - respondents, Cagayan Province, 2010.

| Municipality | Fgt (0) Headcount | Fgt (1) Poverty Gap | Fgt (2) Poverty Severity |
|---|---|---|---|
| Baggao | | | |
| With AFI | 0.044 | 0.006 | 0.001 |
| Without AFI | 0.712 | 0.265 | 0.134 |
| Gonzaga | | | |
| With AFI | 0.066 | 0.018 | 0.006 |
| Without AFI | 0.761 | 0.343 | 0.194 |
| Lallo | | | |
| With AFI | 0.549 | 0.257 | 0.153 |
| Without AFI | 0.867 | 0.560 | 0.440 |
| ALL | | | |
| With AFI | 0.219 | 0.094 | 0.054 |
| Without AFI | 0.780 | 0.389 | 0.256 |

The households in Baggao have an income shortfall of 0.60 percent of the poverty line. If forest income is not included, the number of households below the poverty threshold increases to 71 percent, and on the average, the poor has an income shortfall of 26 percent of the poverty line. In Gonzaga, results show that 6.6% of the sample households are below the 2009 poverty threshold. They have an income shortfall of 1.8 percent of the poverty line. If forest income is not included, the number of households below the poverty threshold increases to 76 percent, and on the average, the poor has an income shortfall of 34 percent of the poverty line. Without forest income, poverty severity or the inequality among the poor is 19 percent, but it is reduced to 0.6 percent with forest income. In the municipality of Lallo, results show that 55 percent of the sample households are below the 2009 poverty threshold. They have an income shortfall of 26 percent of the poverty line. If forest income is not included, the number of households below the poverty threshold increases to 86 percent, and on the average, the poor has an income shortfall of 58 percent of the poverty line. This is consistent in relation to the findings on the average household income. Among the municipalities, on the average, Lallo has the lowest, PhP 130,870. This situation may also reflect the welfare status and the asset status of the households in the municipality. On the average, they are farthest from the clinic, hospital, school and source of potable water.

As to their asset status, on the average, they had the least total value and had the smallest size of farmland. All these affect their income generating capabilities.

*Gini Decomposition by Income Source*

Decomposition of the contributions of forest income and other income sources to total per capita household income and income inequality for the municipality of Baggao, shows that the principal sources of household income for the entire sample are forest income at 46 per cent and crop income at 34 per cent. The lowest source Gini comes from forest income with a Gini coefficient of 18 percent. This implies that forest income has a very high equalizing income effect in the area after crop income.

**Table 7.** Gini decomposition by income source,365 household-respondents, Baggao, Cagayan Province, 2010.

| Income Source | Share In Total Income (Sk) | Income Source Gini (Gk) | Gini Correlation With Total Income (Rk) | Share | % Change |
|---|---|---|---|---|---|
| Forest income | 0.4631 | 0.1795 | 0.7348 | 0.2235 | -0.2397 |
| Crop income | 0.3494 | 0.5122 | 0.6580 | 0.4307 | 0.0813 |
| Income (skilled) | 0.0369 | 0.9486 | 0.6592 | 0.0844 | 0.0475 |
| Remittance | 0.0652 | 0.9545 | 0.7671 | 0.1747 | 0.1094 |
| Income (unskilled) | 0.0853 | 0.7845 | 0.3543 | 0.0867 | 0.0014 |
| Total income | | 0.2734 | | | |

Results of column 3 indicate the Gini correlation (*Rk)* for all income sources. This implies that sources of income with Gini correlation or concentration ratios (R*k*) with values lower than 0.27 (i.e., the aggregate income Gini), help reduce total income inequality. Results in column 4 indicate that, all else being equal, increased income shares from income from forest, crop, remittance and income from skilled work and income from unskilled work are associated with higher income inequality.

The results of the decomposition of the contributions of forest income and other income sources to total per capita household income and income inequality is presented in Table 8 for Gonzaga. The first column, labeled *Sk*, represents the share of each income source (i.e., forest income, crop income, income from skilled work, remittance and income from asset sale) in the per capita total income for the sample. As observed, the principal sources of household income for the entire sample are forest income at 49 per cent and crop income at 27 per cent. The second column labeled *Gk*, presents the Gini coefficient for each income source. As shown, the lowest source Gini comes from forest income with a Gini coefficient of 19 percent. This implies that forest income has a very high equalizing income effect in the area after crop income. As indicated, the share of total income inequality attributed to forest income is 0.35. This implies that forest income as income source contributes the largest share to total income inequality in the area. This is largely due to the fact that this source made up the highest share of aggregate household income.

**Table 8.** Gini decomposition by income source, 213 household-respondents, Gonzaga, Cagayan Province, 2010.

| Income Source | Share In Total Income (Sk) | Income Source Gini (Gk) | Gini Correlation With Total Income (Rk) | Share | % Change |
|---|---|---|---|---|---|
| Forest income | 0.4900 | 0.1919 | 0.6841 | 0.3534 | -0.1366 |
| Crop income | 0.2713 | 0.3576 | 0.4920 | 0.2623 | -0.0090 |
| Income (unskilled) | 0.1084 | 0.4580 | -0.0297 | -0.0081 | -0.1164 |
| Remittance | 0.0250 | 0.8957 | 0.5731 | 0.0706 | 0.0456 |
| Sales of assets | 0.1052 | 0.7661 | 0.7262 | 0.3217 | 0.2165 |
| Total income | | 0.1820 | | | |

To further assess whether a given source of income reduces or increases income inequality, all else being equal, the rule is that if *Rk* > *Gk* and the share of source income (*Sk)* is increased or decreased, then income inequality (*Gk*) will increase or decrease (Fisher, 2004).

Results of column 3 indicate the Gini correlation (*Rk)* for all income sources. This implies that sources of income with Gini correlation or concentration ratios (R*k*) with values lower than 0.18 (i.e., the aggregate income Gini), help reduce total income inequality. Results in column 4 indicate that, all else being equal, an increased share of income from skilled work lowers income inequality in the area; while increased income shares from income from forest, crop, remittance and income from asset sales are associated with higher income inequality.

Table 9 presents the results of the decomposition of the contributions of forest income and other income sources to total per capita household income and income inequality in the municipality of Lallo As observed, the principal sources of household income for the entire sample are forest income at 48 per cent and other sources at 38 per cent.

The lowest source Gini comes from forest income with a Gini coefficient of 31 percent. This implies that forest income has a very high equalizing income effect in the area after crop income. As indicated, the share of total income inequality attributed to forest income is 0.31. This implies that forest income as income sources contributes the largest share to total income inequality in the area. This is largely due to the fact that this source made up the highest share of aggregate household income as shown.

**Table 9.** Gini decomposition by income source, 113 household-respondents, Lallo, Cagayan Province, 2010.

| Income Source | Share In Total Income (Sk) | Income Source Gini (Gk) | Gini Correlation With Total Income (Rk) | Share | % Change |
|---|---|---|---|---|---|
| Forest income | 0.4859 | 0.3141 | 0.6660 | 0.3068 | -0.1791 |
| Crop income | 0.1272 | 0.8855 | 0.8219 | 0.2796 | 0.1524 |
| Other income | 0.3864 | 0.4673 | 0.7612 | 0.4150 | 0.0286 |
| Total income | | 0.3312 | | | |

Results of column 3 indicate the Gini correlation (*Rk)* for all income sources. This implies that sources of income with Gini correlation or concentration ratios (R*k*) with values lower than 0.33 (i.e., the aggregate income Gini), help reduce total income inequality. Results in column 4 indicate that, all else being equal, increased income shares from income from forest, crop and income from other sources are associated with higher income inequality.

*Determinants of Forest Dependence*

In order to analyze the relationship between forest dependence and household level factors, an ordinary least squares regression of forest dependence against specific variables was done. These variables included age of the household, head gender of the household head years of schooling, number of years residing in the community, distance to clinic size of land owned, machine value, distance to market, distance to forest, distance to school, water buffalo( carabao) value. The results of estimation are shown in Table 10.

Results show that the significant factors are years of schooling of the household head, distance of the household from the clinic, size of the land owned by the household, machine value, distance of the household from the market, and distance of the household from the forest. For every additional year of schooling of the household head, the percentage of income derived from forest resources decreases by about one percent, all things being the same. Education creates opportunities for off-farm employment, self-employment and may also facilitate out-migration for better jobs, thereby reducing forest dependence.

**Table 10.** Regression model showing the determinants of forest dependence, 691 household-respondents, Cagayan Province 2010 Full Model. Dependent Variable (Forest Dependency – Percentage of Household Income Derived from Forest Resources).

| Explanatory Variable | Coef. | Std. Err. | T-Statistic | P-Value |
|---|---|---|---|---|
| Age of the household head | -0.0009 n.s.. | 0.0007 | -1.3500 | 0.1780 |
| Gender of the household head | -0.0106 n.s. | 0.0261 | -0.4100 | 0.6840 |
| Years of schooling | -0.0122 ** | 0.0020 | -5.9400 | 0.0000 |
| Number of years residing in the community | 0.0003 n.s. | 0.0005 | 0.6600 | 0.5130 |
| Distance to clinic | -0.0044 ** | 0.0018 | -2.4900 | 0.0130 |
| Size of land owned | -0.0197*** | 0.0044 | -4.5100 | 0.0000 |
| Machine value | -0.0025*** | 0.0000 | -3.5200 | 0.0000 |
| Distance to market | -0.0035** | 0.0015 | -2.2900 | 0.0230 |
| Distance to forest | -0.0072*** | 0.0026 | -2.8000 | 0.0050 |
| Distance to school | 0.0015 n.s. | 0.0027 | 0.5600 | 0.5740 |
| Carabao value | -0.0003 n.s. | 0.0000 | -0.4100 | 0.6820 |
| Constant Term | 0.7749 | 0.0379 | 20.4300 | 0.0000 |

R-squared = 0.2413.

*** significant at 1% probability level.

** significant at 5% probability level.

n.s.. Not significant at 10% probability level.

For every additional kilometer distance of the household from a clinic, the income derived from the forest decreases by about four percentage points, controlling for other factors. This suggests that going to a clinic implies trade off. Travelling to the clinic implies not only financial cost but also the travel time spent.

Travel time deprives a member of a forest-dependent household the opportunity to undertake forest-income generating activities. Hence, forest income will be reduced. For an additional hectare of land owned, the percentage of income derived from the forest decreases by two percentage points. This suggests that given productive assets such as farmland, forest dependence will be reduced. Ownership of farmland necessarily requires investment for land improvement to achieve higher yield. Owners will spend more time in the farm for land preparation, planting and making sure that there is sufficient water for the crops. With larger size of farmland, farmers can have the option to diversify crops that can ensure not only food but also income security. For every additional PhP 1,000 peso increase in the value of the machinery owned by the household, the percentage of income derived from the forest decreases by about 0.25 percent, all things being the same. Increase in the value of machinery such as hand-held tractor suggests that improvement were made to enhance its capacity. Hand-held tractors are used primarily to plow farmlands. However, these could be used in hauling crops. Carriers are made which can be drawn conveniently by the hand-held tractor. By doing farm-related activities, households will have lesser time to undertake forest income generating activities.

For every one kilometer distance from the market to the household, the percentage of income derived from forest decreases by about 0.35 percentage points. The cost of travelling in bringing forest products to the market reduces household forest income. Given the limited number of public as well as private transportation in the areas, their only choices are whether to walk or to shoulder the expensive charges imposed by the transport operators. Both options however, mean reduced income from forest.

For every one kilometer distance of the household from the forest, the percentage of income derived from forest decreases by about 0.72 percentage point. Travel time deprives the forest-dependent households the opportunity to undertake forest income generating activities.

The farther the household from the forest suggests lesser frequency of going to the forest, hence lower forest income

**Conclusions**

The general objective of this study was to assess the link between poverty and forest dependence in the Cagayan Province, Philippines during the period 2010-2011. The primary data used in the study were gathered by conducting a field survey. Secondary data were gathered from various government local and national agencies. The objectives of the study were achieved using the following analytical tool: tabular analysis, F-test for comparison of means, and ordinary least squares regression. As to the demographic characteristics of the household-respondents, on the average, they were 46 years old. At this age, they are capable of undertaking activities that demand physical strength. They had low level of schooling, on the average, at seven years or a graduate at the elementary level. They have been residents in their communities for 36 years, on the average. This suggests that many of them were migrants coming from other municipalities of the province and even from other provinces. This length of residency in the communities also suggests that they are already familiar with their environment. They have the average size of a household similar with the national level which is five members. As to their access to basic social services, on the average, they were five kilometers away from the nearest clinic and 14 kilometers away from the nearest hospital. This suggests that they have difficulty in accessing basic health services. They are also five kilometers away from the nearest school. This suggests that with the absence of public transport system, school-going members of the households must hike or may decide not to go to school anymore. As to the source of potable water, households are near the sources. Water is essential for cooking, washing clothes and for drinking, therefore, they must have a source. However, some households get their water from spring suggesting that they are very near the forests. This may also condition them to go to the forest and undertake forest-income generating activities.

Most of their possessions were productive assets. These were water buffalo, cow, livestock, hand-held tractor, house, and farmland. On the average, the households in Lallo had the highest value of total assets because of their investment for building their houses while Baggao has the least total value. However, this picture changes if the size of farmland is taken into account. Households in Baggao had the largest size of farmland compared to those in Gonzaga and Lallo.

As to the conditioning factors, on the average, the households are nine kilometers away from the nearest market. This has implication for their decision to extract more from the forest to compensate for travel costs. On the average, they are very near the forests. Proximity to the source of livelihood is favorable to the households in relation to cost considerations. Forest-dependent households had several sources of income. As to the sources of non-forest income, these included sales of crop, wages from unskilled work, wages from skilled work, sales of assets, other income and remittance. However, on the average, crop income was the highest source of their non-forest income which is 48 percent of the total non-forest income.

On the average, poverty headcount or the number of households below the threshold level was 22 percent if forest income is accounted for. However, the situation worsens if forest income is not accounted. Poverty head count becomes 78 percent. They have an income shortfall of 9.4 percent of the threshold with forest income, however, this becomes 39 percent if forest income is not included. The severity of poverty is 5.4 percent implying that there is 5.4 percent inequality among the poor. Among the municipalities, Lallo had the highest poverty incidence, both with and without forest income. This may be attributed to the finding that, on the average, cash forest income in this municipality had a lower contribution compared to the other municipalities. In all the municipalities, forest income contributed the largest share to total income inequality of the total household income, on the average, forest income had a larger contribution (53 percent) than non-forest income (47 percent). This is consistent with the finding that, on the average, the communities in the Cagayan Province had high forest dependence. Around 59 percent and 33 percent of them reported to have a high and medium forest dependence while only eight percent reported to have low dependence.

The factors that determine forest dependence are years of schooling of the household head, distance of the household from the clinic, size of the land owned by the household, machine value, distance of the household from the market and distance of the household from the forest. All these variables have a negative effect on forest dependence.

The years of schooling of the household head has a negative effect on forest dependence. Every additional kilometer- distance of the household from a clinic results to a decrease in the income derived from the forest by about four percentage points, controlling for other factors. For an additional hectare of land owned, the percentage of income derived from the forest decreases by two percentage points. For every one kilometer distance from the market to the household, the percentage of income derived from forest decreases by about 0.35 percentage points. For every one kilometer distance of the household from the forest, the percentage of income derived from forest decreases by about 0.72 percentage point.

**Recommendations**

There is lack of access by the forest dependent-households to social services. For households with low incomes, lack of access to education tends to exacerbate poverty due to the cost associated with traveling. Thus, providing primary and elementary schools through public investments may be undertaken to correct the unequal opportunities in so far as access to education is concerned. Access by households to health service providers such as clinics and hospitals is also limited due to their geographic distance. It is therefore necessary that public investment in the provision of basic health services be undertaken by the government. The “doctor to the barrio” program of the government encourages

medical practitioners particularly doctors of medicine to render service in the rural areas. This is one way by which the government could monitor the health status of the rural households.

There is high degree of forest dependence among the households. This in the long run may lead to a highly fragile ecosystem. On the other hand, households are generating much of their livelihood from the forest. There is now a dilemma as to whether what must be done: to protect the forest or to deprive the households of their livelihood. Protection and conservation of the forests may still be undertaken by ensuring that the rate of extraction must not exceed the rate of replenishing, say by means of reforestation. An incentive scheme can be devised such that forest users may be compensated by means of a stewardship title. However, a recipient for example, must show proof that he can reforest a denuded forestland. The awarding of tenurial instruments to forest-dependent households is necessary, however, not a sufficient condition towards effective management and judicious utilization of forest resources. Related infrastructure projects such as construction of roads, reliable transport system and rural electrification may be undertaken. These will integrate the rural communities into the modern sector and may provide and offer households greater options and opportunities for income generation. This will not only address forest dependence but also rural poverty.

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